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Vol. XXVI No. 3 MARCH, 1941

The Welding Engineer

ABP ABC MEMBER

Associated Business Papers
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Chicago: Tel. Wabash 7134

Pacific Coast Representative:
W. R. McINTYRE, 400 East Third St.
Los Angeles, Calif.

Published on the 1st of each month by The Welding Engineer Publishing Company, 506 South Wabash Ave., Chicago, Ill.
Telephone Webster 7134

Advertising copy must be received not later than the 20th of the preceding month.

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Subscription, payable in advance: United States and possessions, and Canada, $3 a year; Foreign Countries, $4 a year; Single copy, domestic, 25 cents; Single copy, foreign, 35 cents. Copyright, 1941, by Welding Engineer Publishing Co. Entered as second-class matter January 20, 1916, at the postoffice at Chicago, Illinois, under the act of March 3, 1879.

FOREIGN REPRESENTATIVES: AUSTRALIA and NEW ZEALAND—R. Hill, Matlock House, Davenport, Auckland, New Zealand; GREAT BRITAIN—A. D. Baynes, 1 Cambridge Park Court, Twickenham, Middlesex, England; SOUTH AFRICA—J. W. Arnison, 35a Victoria Avenue, Benoni, Transvaal, South Africa; JAPAN—Maruzen Company, Ltd., 6, Nihonbashi, Tori-Nichome, Tokyo, Japan; U. S. S. R.—Mesdunarodnaja Kniga, Kusnezki Most 18, Moscow, U. S. S. R.

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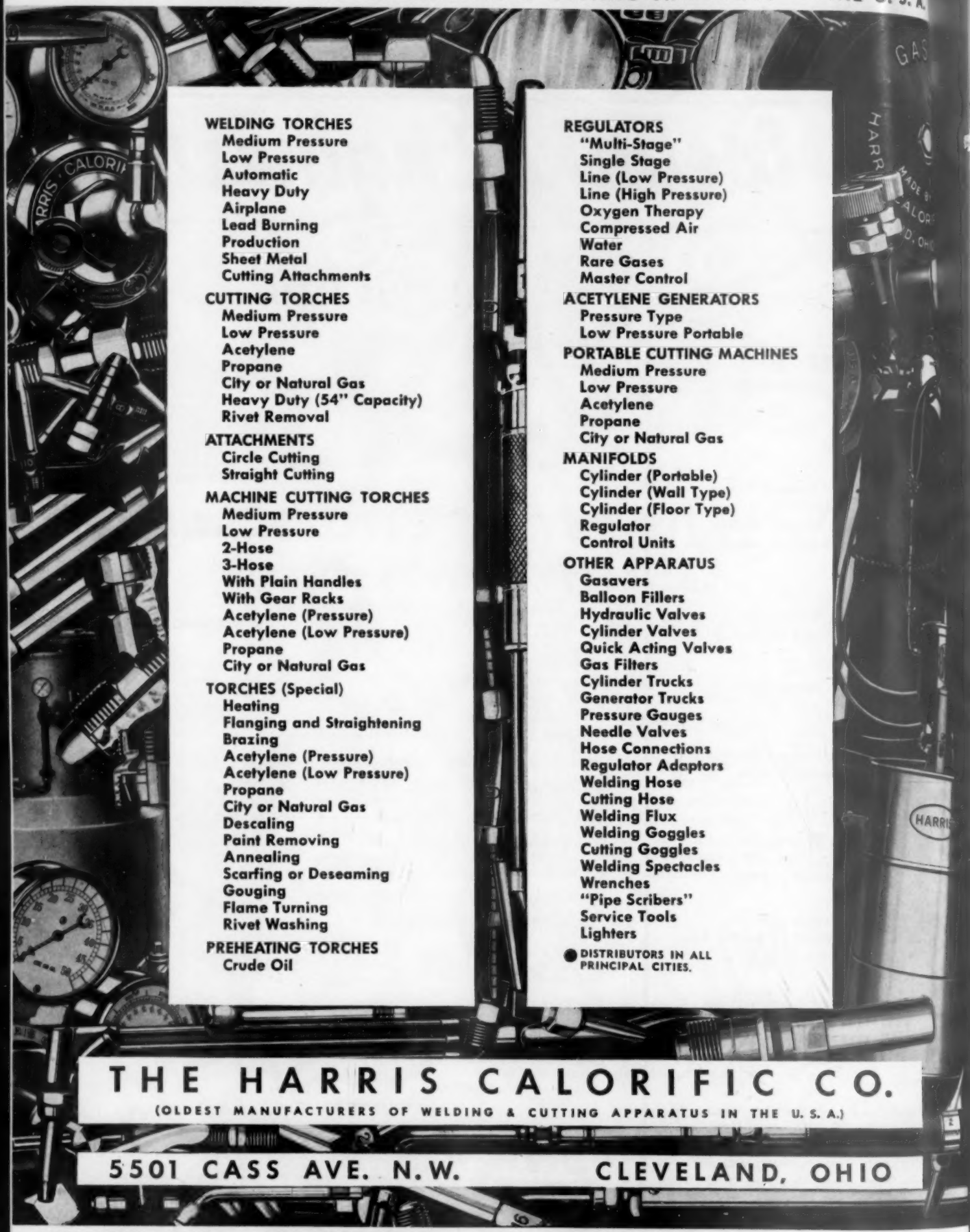

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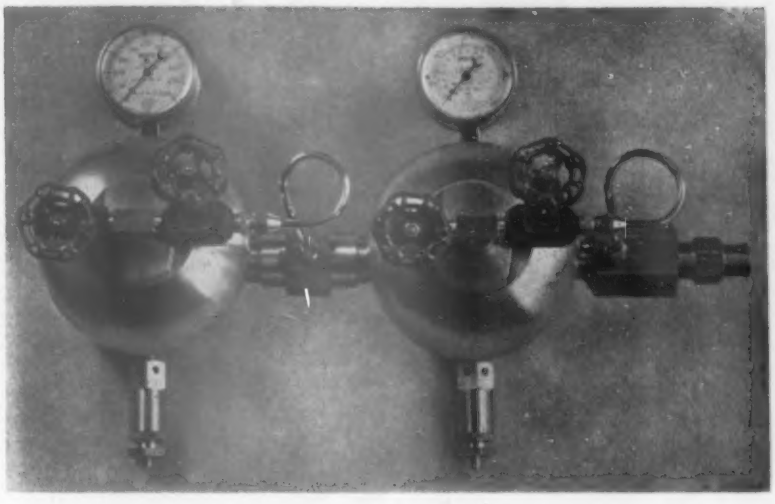


Fig. 1 — A gas-loaded diaphragm type, tandem, large capacity manifold regulator.

GAS REGULATION

by

E. L. MATHY

Vice President
Victor Equipment Co.
San Francisco

★ Gas Regulators are frequently thought of as being used only in connection with welding or domestic and industrial gas uses. These applications, however, represent only two of many uses; many scientific, medical and military activities are dependent upon gas regulation for their success. Regulators of this nature and their work are described.

THE CONSTANTLY broadening usefulness of compressed gases has resulted in a demand for accurate and reliable regulators in many new fields of industry. Many of these applications are little known and require special design adaptations. The wide application of pressure reducing regulators in the welding industry, however, places manufacturers of these precision instruments in a most favorable position to expand the usefulness of these devices into many fields.

A majority of the readers of *The Welding Engineer* are fully familiar with the various types of oxygen and fuel gas regulators utilized in connection with cylinder gases and pipe line distributing systems.

These regulators, however, are only two of the many types of regulator welding equipment manufacturers are called upon to produce. Many industries and applications which only a few years ago seemed to be far away from the need of gas volume and pressure control now find their activities dependent upon proper gas regulation. The commercial air transport with its substratosphere flying schedule is an example of the need of gas regulation for pressure control, yet only a few years ago such need could not be visualized.

Examples equally as striking may be found in other industrial and medical applications. Since the manufacture of gas regulating equipment is one of the activities of the welding equipment manufacturer, the manufacturers of these precision instruments have done much in developing equipment of this type for other industires. During this development period, however, welding equipment has not been neglected. Great improvements have been made in this equipment during the past decade —the two outstanding improvements probably were the combining of separate regulators into one common body, thus creating the so-called "two-stage reduction" regulator (Fig. 2) and the refinements made to the so-called "gas-loaded diaphragm" types of regulators.

Two-Stage Regulator

The idea of two-stage reduction is not a new one. For many years one combined two separate regulators—tandem fashion — to limit refrigeration by the simple expedient of reducing the high initial cylinder pressure to approximately 150 p.s.i. with the first regulator and then achieving actual delivery pressure by the second one. Tandem arrangements of this kind,

Fig. 2—A Two stage reduction regulator for welding and cutting operations.

however, proved cumbersome and unwieldy. A two-stage reduction type of regulator can be furnished either with adjustable primary reduction stage or with this stage permanently set. The former type increases the usefulness of the regulator but has the disadvantage of confusing some operators who might overlook adjusting this primary reduction stage to a sufficiently high pressure to achieve the desired secondary delivery pressure.

Gas Loaded Type

An ideal pressure reducing regulator is the type with gas-loaded diaphragm, but the production cost is considerably higher than that of the spring-loaded diaphragm type so that its usefulness is restricted to special applications demanding an unusually wide delivery pressure range. For very high initial pressures as well as high delivery pressures, the gas-loaded diaphragm regulator type is preferred because springs concentrate the effect of their downward pressure too much. Under high pressure work they do not produce a dependable and evenly graduated pressure range.

With the advent of torch scarfing and gouging, flame machining and kindred processes requiring relatively large quantities of oxygen and fuel gas, the gas capacity of standard welding and cutting regulator designs proved inadequate. This brought about the design and production of large capacity regulators. Since large volumes of oxygen, for instance, might be furnished either by the proper manifolding of a sufficient number of cylinders or through a pipe line distributing system at prereduced pressures, the required regulator types vary.

Large Gas Volume

For large, high pressure gas, cylinder manifold installations and hourly gas consumptions up to 100,000 cubic feet per hour, tandem regulator installations are usually preferable. The first stage of reduction can be handled by a sufficiently sturdily constructed and spring-loaded diaphragm type of regulator such as illustrated in Fig. 3. For final operating pressures, a large capacity gas-loaded diaphragm type

Fig. 3—A Large capacity, spring-loaded diaphragm type, manifold regulator.

of regulator is suggested as is shown in Fig. 5.

While it is entirely feasible to design a gas-loaded diaphragm type two-stage reduction regulator for high capacity work, the large capacity requirements call for a relatively large low pressure regulator chamber. This makes a two-stage reduction regulator quite cumbersome and more difficult to repair should reconditioning or changing of the regulator seat become necessary. Single stage reduction of very large gas volumes can be achieved by a gas-loaded type of regulator and this type is often employed in the natural gas and in the oil industries, but the accurate pressure maintenance needed by flame hardening, scarfing or gouging torches makes the tandem installation more dependable.

In Fig. 1 is illustrated a tandem installation utilizing gas-loaded diaphragm type of regulators. These particular regulators are provided with loading and unloading valves. Where desirable these loading and unloading valves can be located at any reasonable distance away from the actual location of the regulator so as to offer remote control.

The same regulator installation illustrated in Fig. 1 can also be provided with built-in pilot regulators thus offering the advantage of definitely limiting the maximum regulator diaphragm loading pressures and at the same time precluding accidental overloading. Where the delivery pressure should be maintained with unusual accuracy, an adjustable relief valve may be attached to the diaphragm dome to release excessive pressure caused by the expansion of the gas within the diaphragm dome at rising gas temperatures. The built-in pilot regulator will of course automatically restore the desired loading pressure should cooling of the gas diminish it.

Laboratory Regulators

For certain types of laboratory work regulators are occasionally required for primary pressures exceeding 5000 p.s.i. and for working pressures approaching 5000 p.s.i. These regulators must obviously be constructed very sturdily and of very dense metals. Fig. 4 illustrates such a regulator. It is of the gas-loaded diaphragm type and combines loading and unloading valve mechanism to facilitate very accurate and instantaneous work-

Fig. 4—This high pressure, "Gas-O-Dome" regulator has a delivery pressure range of up to 5000 p.s.i.

ing pressure adjustment. The internal mechanism is such that the diaphragm motion is quite limited and its entire surface is so cushioned that rupture or shearing is virtually impossible. This regulator model can be equipped for remote control and the remote control stage itself is provided with diaphragm loading pilot regulator.

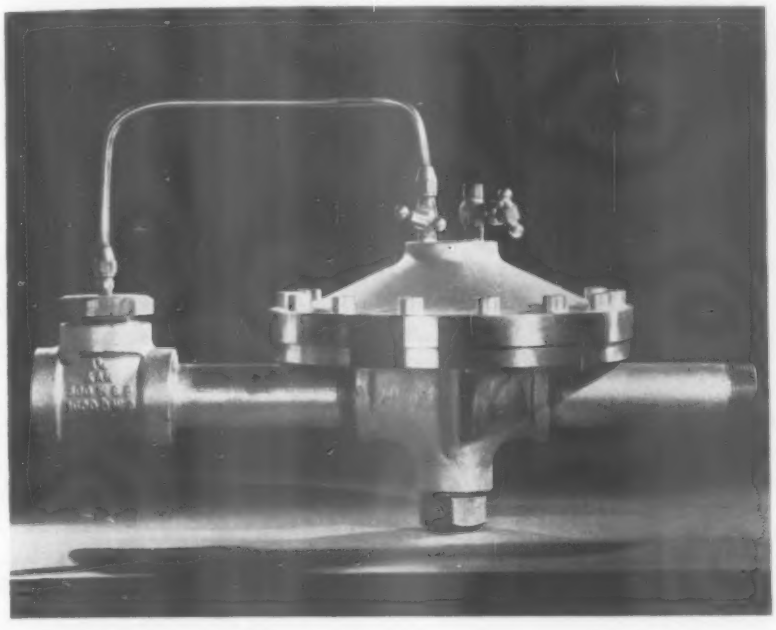


Fig. 5 — A gas-loaded diaphragm type, very large capacity, manifold regulator.

Regulator Requirements

Regulators are available for every type of fluid or gas, for all encountered pressure ranges and virtually all volumetric requirements. They are attached to gas or liquid operated machine tools; they facilitate the testing of cables with nitrogen; they maintain uniform pressures in transformers; they make possible paint or metal spraying. They enter hospitals and operating rooms; they are sent to stratosphere heights or function below sea level. They maintain a stream of minute gas bubbles in connection with laboratory tests or furnish, uninterruptedly, hundreds of thousands of feet of gas per hour or minute. Regulators control the loading pressures of torpedos and aid in the operation of submarines. They maintain steam pressure; guard water distributing lines; administer pain saving anaesthetics, ease the pneumonia patient and aid in the cure of bronchial afflications. They sustain the lives of the stratosphere pilot and his crew and have become an essential part of the military flyer's parachute equipment.

Volumetric Regulation

Wherever regulators are employed gauges are usually needed to indicate pressure or volumetric flow. For the majority of purposes the well known Bourdon tube type gauge is adequate. These gauges might be provided with dials graduated in any desired pressure reading or to indicate volumetric flow in gallons or liters or cubic feet per minute. Where the gauge dial is calibrated to register volumetric flow per minute, it is necessary to have the outlet bushing drill size carefully synchronized with that gauge. The disadvantage of the Bourdon tube in connection with volumetric flow determination lies in the fact that this gauge will indicate flow even though all outlets be closed. In the medical field it is frequently quite essential that the flow reading be accurate under all circumstances and here it is preferable to employ the so-called tubular gauge illustrated in Fig. 6.

A gauge of this type might obviously be employed only in connection with relatively low operating pressures since the tube is made out of transparent material which might be glass or a substance similar to lucite. A longitudinal orifice, accurately tapered, permits a ball to rise with increased velocity of the passing gas. The tube may be graduated to read in liters, gallons or cubic feet flow per minute. An orifice running parallel with the tapered one returns the gas to the outlet which is usually incorporated into a common forging. When the flow of the gas ceases, the ball drops to zero position.

Fig. 6—One of a series of medical regulators equipped with tube type litre flow gauge.

The proper selection of a regulator to meet any particular need safely and adequately requires a complete understanding of the available design and construction features and it is therefore economical to consult with those who are experts in this field.

THE END

GAS WELDING MAGNESIUM

★Magnesium, our lightest commercial metal, is becoming an important material in aircraft construction. Welding magnesium alloys present many problems and pitfalls which must be avoided in the fabrication of this highly combustible material. There is described the technique to be used in gas welding magnesium alloys and the precautions to be taken.

MAGNESIUM IS rapidly becoming an important metal for use in the manufacture of aircraft. Its increased popularity may be attributed to: (1) Its abundance in nature, of the industrial metals magnesium is exceeded in abundance only by iron and aluminum; (2) Its lightness, magnesium alloys is one-third lighter than aluminum alloys yet equally as strong; and (3) favorable cost with competing metals, at current market prices magnesium is selling for 27 cents per pound as compared to 17 cents per pound for aluminum. These factors coupled with the ability of magnesium alloys to be fabricated readily, have contributed greatly to its acceptance by the aircraft industry.

The magnesium alloys now in popular use contain 90% or more magnesium alloyed with aluminum, manganese, copper, tin, silicon and zinc. Most of these alloys can, with varying degrees of success, be fabricated by welding with the following welding processes commonly employed: Oxy-acetylene welding (oxy-hydrogen with difficulties) and spot, seam and butt resistance welding. To date, magnesium alloys are not commercially welded by either the atomic hydrogen process or metallic or carbon arc processes. As there are many problems to be discussed, this article will be confined to the welding of magnesium alloys by the oxy-acetylene process. There will appear in a future number of *The Welding Engineer*, an article on resistance welding of magnesium.

Table I—Commercial Magnesium Alloy for Aircraft Construction

Alloy—Trade Name		Aluminum	Manganese	Zinc	Other	Magnesium	Weldability
Dowmetal A[1]	AM-241	7.0 - 9.0	0.2 min	0.3		Balance*	Limited
Dowmetal E[2]	-	5.5 - 6.5	0.2 min	-		"	Fair
Dowmetal F[3]	AM-53S	3.5 - 6.5	0.2 min	-		"	Readily
Dowmetal H	AM-265	5.5 - 6.5	0.1 - 0.3	2.4 - 3.3		"	Limited
Dowmetal J[4]	AM-57S	5.8 - 7.2	0.2 - 0.6	0.5 - 1.0		"	Fair
Dowmetal M	AM-3S	-	1.2 min	-		"	Best
Dowmetal O[4]	AM-58S	7.8 - 9.2	0.2 - 0.6	0.2 - 0.8		"	Fair
Dowmetal X[4]	AM-74S	2.5 - 3.5	0.2 min	3.0	Tin	"	Limited
	AM-61S	9.0 - 11.0	0.1 min	1.0	5.0 - 7.0	"	Limited

(1) Dowmetal A largely replaced by Dowmetal H for sand castings and Dowmetal O for forgings and extrusions.
(2) Dowmetal E an improvement over Dowmetal F for sheets and plates.
(3) Dowmetal F largely replaced by Dowmetal J and X for extrusions and forgings.
(4) When conforming to Navy Specifications for low iron and nickel impurities designated with suffix (-1 e.g., J-1, O-1 and X-1.
* Maximum total impurities—0.3%; 0.1% copper permissible in some alloys.

OF ALLOYS

by
TED JEFFERSON
Editor

Fig. 1—Welding a magnesium casting to a magnesium sheet in the fabrication of an oil tank. (Photo Dow Chemical Co.)

The chemical composition of some of the more common of the commercial magnesium alloys used in this country in aircraft fabrication are tabulated in Table I. These alloys are produced by Dow Chemical Co. and American Magnesium Corp. which is allied with the Aluminum Co. of America. These two companies are the major producers of magnesium alloys and designate their products by the trade names of Dowmetal and AM, respectively.

Welding Characteristics

The welding qualities of magnesium alloys are in many respects quite similar to aluminum in that they have the following characteristics in common: High heat conductivity, low melting point and a high thermal expansion quality. There are, however, two important points in which magnesium alloys are very different from those of aluminum, they are: (1) The greater likelihood of the magnesium alloys to crack during welding and working and (2) the higher sensitivity of magnesium alloys to the notch effect in fatigue. Because of this second difference, all tool marks resulting from machinery before or after welding should be eliminated and similarly all weld inclusions, such as, gas or slag inclusions or crack during welding must be avoided.

Magnesium alloys of a weldable analyses cannot be welded to aluminum alloys or to other metals, nor can they be torch cut. These alloys may be obtained in a number of different forms, such as, sand and die castings, sheets, plates, bars and extruded shapes, and may be welded to one another. The more nearly the pieces approach each other in chemical composition the more readily they may be welded. The strength of the completed weld is somewhat between that of the sand cast alloy (25,000 p.s.i.) and the extruded alloy (40,000 p.s.i.) depending on the alloy. For example, welds on castings are usually equal in strength to good castings while welds on extruded alloy developed only 75% to 90% of the strength of the extruded shape.

Joint Preparation

The first step in any welding operation is the preparation of the joint. In the welding of magnesium alloys it is most important that the pieces to be joined are properly prepared. Prior to any welding operation, the items to be welded should be cleaned of all grease, oil or dirt with a non- corrosive solvent such as a hot alkaline cleaner, naphtha, gasoline or carbon-tetrachloride. As a rule magnesium alloys are given a corrosion resistant coating by the producer. If this is the case, this protective coating and all traces of oxidation must be removed from the edges and the adjacent surfaces of the pieces to be welded. This careful cleaning and brightening operation may be accomplished with emery cloth, steel wool, files, scrapers, or wire brushes.

When castings, forgings or extrusions are to be welded to sheets, the thickness of their sections along the seam junction should be ap-

proximately the same thickness as that of the sheets. If not, it will be necessary to preheat the heavier fittings prior to welding so that the two edges of the seam will begin to melt simultaneously.

Welding Difficulties

In welding magnesium alloy sheets or strips 0.050 in. thick or less, the weld may be of a flange, butt or fillet type with the flange type preferred. These flanges must be welded down into a plain butt before the completion of the weld, however, because of the danger of trapping corrosive flux. Up to ⅛ in. all thickness of metals are butted for satisfactory welds. Thicker sheets must have the edges to be welded beveled to about 45 deg., and an unchamfered lip, not more than 1/16 in., may be left to insure proper penetration when the material is over ¼ in. thick.

As shown in Figure 2, there are certain types of joints which must be avoided when welding magnesium alloys. The difficulty experienced in flux removal after welding makes it unwise to use lap, fillet, plug and in some cases, corner welds. Corner and fillet welds may be permissible if root penetration is complete (See T-welds of Fig. 3). Care should be taken, however, to see that there will be no closely jointed surfaces or crevices to trap flux.

Flux

The use of flux is most important in the welding of magnesium alloys. Proper uses of fluxes prevent the formation of oxides during welding, they also dissolve those oxides present which are very refractory to chemical attack and temperature. There are available several commercial fluxes for use in welding magnesium alloys and in some cases satisfactory results have been obtained using aluminum flux. analyses of some fluxes disclose the basic ingredients are lithium or magnesium chlorides mixed with varying amounts of alkali and frequent other metallic florides and chlorides.

Since these fluxes are usually in powdered form and readily absorb moisture, with a resultant loss in effectiveness, they must be kept in tightly closed containers. The flux is prepared for use in welding by mixing with water until a paste is formed. Usually about ½ pint of water to one pound of flux produces a paste of the desired consistency. Only a small quantity, not over a day's supply, should be prepared at one time owing to the loss of efficacy that occurs if not readily used.

This paste mixture is applied to the welding rod either by dipping or with a small swab or brush. It is usually recommended that the rod be heated to approximately 400 deg. F. prior to fluxing in order to obtain a more uniform coating. It is also advisable to apply flux to both surfaces of the pieces to be welded, but particularly the under side of the seam to prevent oxidation of the penetration bead.

Filler Rod

Welding rods of approximately the same chemical composition as the base metal should be used in welding magnesium alloy sheets. It is especially important that the rod be the same composition as the sheet when fitting either case or forged arc welded to a sheet. While there are commercial rods available, for all weldable magnesium alloys if none are available, strips cut from the sheet may be used.

So that the correct welding rod may be readily identified they have the following distinct characteristics.

Dowmetals are distinguished by a color system:

Dowmetal F ..... Blue
Dowmetal J or J-1 .... Yellow, Green and Aluminum
Dowmetal M ..... Yellow

American Magnesium welding rods are identified by their standard cross sections:

AM 3S ..... Round
AM 52S and AM 53S ..... Square
AM 57S ..... Triangular
AM 88S ..... Oval

Like all magnesium alloys, the commercial welding rods are supplied with a corrosion resistant coating which must be removed by wire brushing or with steel wool before using. After a welding operation, all traces of flux should be removed from the unused portion of the rod.

Welding Procedure

After the pieces have been spaced properly for welding, they should be clamped securely to minimize straightening after welding, more clamps being required for magnesium alloys than for aluminum. Considerable care is necessary to avoid stressing the metal on those parts to be welded in jigs, while it is hot because of the tendency of these parts to crack. It has been found that, in general, the same practice as followed in welding aluminum will be satisfactory except that a greater number of tack welds are required.

In welding magnesium, the oxy-acetylene torch is adjusted and used

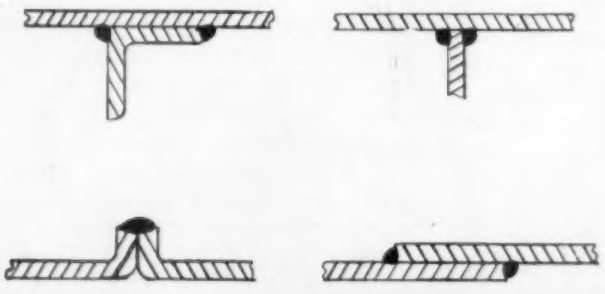


Fig. 2—Welds similar to these are subject to flux inclusions and should not be used in welding magnesium alloys.

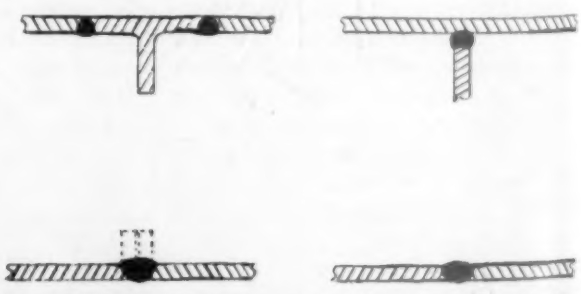


Fig. 3—Welds like these may be thoroughly cleaned without difficulty and are therefore recommended for use in fabricating magnesium alloy structures.

in a manner similar to that employed on other metals. A neutral or slightly reducing flame is best as it provides a reducing gas envelope about the molten metal. In no case should an oxidizing flame be used because such a flame will burn the magnesium alloys. The flame should be directed on the work at an angle of about 30 deg. to the plane of the sheets and in line with the weld seam, thus gradually forcing the molten flux ahead of the weld metal. It is especially important when welding thin sheets, that the torch angle be kept as flat as possible to prevent holes being

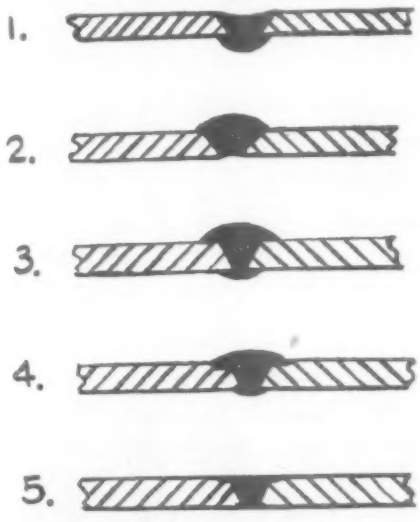


Fig. 4—The cross section of various welds made on magnesium sheets: (1) too much penetration; (2) too little penetration; (3) too heavy reinforcement; (4) correct weld bead and (5) appearance of cross section after cold working and milling.

burned through the sheets. Magnesium alloys give no indication of approaching their melting point so extreme care should be taken at the beginning of a weld to avoid burning. Should any portion of the weld become burned, welding must be stopped and the burned area carefully recleaned by scraping or filing.

The seams should be tacked at intervals of ½ to 2½ in. depending somewhat on the type of joint. Warping during subsequent welding operations may be reduced to a minimum by first completely welding the ends of the seam for 1 to 2 in. Should the sheets warp during tacking, they should be straightened with a wooden mallet while hot. The tacked spots are then refluxed and the entire seam welded keeping in mind that starting and stopping of welding must be kept to a minimum. Upon coming to the end of a bead, it is suggested that an excess of metal be deposited at as low a temperature as is possible. This extra metal will help eliminate shrinkage cracks at the end of the bead. If necessary the sheets are again straightened after welding has been completed. The excess weld metal and slag of the completed weld may be removed by chipping or milling; it should never be hammered down.

In Figure 4 is shown the cross section of various welds made on magnesium sheets: (1) too much penetration; (2) too little pentration; (3) too heavy reinforcement; (4) correct weld bead and (5) appearance of cross section after cold working and milling.

Weld Cleaning

After the weld has been completed and it has cooled sufficiently to be handled, the weld cleaning operation should be begun. The excess welding flux must be completely removed by vigorous scrubbing the weld bead with a stiff bristle brush and hot water. Washing should be continued until the surface is clean. If this is not done promptly, serious corrosion will result. The welded article, when completely cleaned, should then be immersed in a hot anodizing or chrome-pickling solution to neutralize the effects of any remaining flux. In addition to dissolving the last traces of flux, this pickling bath affords additional protection to the weld through the inhibitive character of the chromate coating. This treatment should be repeated where the weld bead is later milled or ground off with the possibilities for further exposing traces of flux. The welded part should then be dried thoroughly and lacquered or painted with an oil and grease solution so that the welded surface is not exposed to the atmosphere.

It should be remembered that much of the success of a weld in magnesium alloys depends upon the effectiveness of the post-weld cleaning and the subsequent corrosion-inhibiting treatment.

THE END

AIRCRAFT STEEL WELDING PRIZE CONTEST

The Summerill Tubing Company, Pennsylvania, is establishing a series of prizes to be awarded by the American Welding Cociety at its annual meeting during October, 1941, for papers to advance the art of welding of aircraft steels including tubing and other steel parts for tubular assemblies.

Conditions:

There will be awarded the following prizes provided that papers submitted are judged worthy of award: One $300 prize, one $200 prize and additional prizes totalling $100 to be disributed for such additional papers as the Committee of Awards may direct.

The papers may treat of any type of welding which is or can be used for the fabrication of structures or assemblies in the production of aircraft steels such as 1025, X4130, X4340 or similar steels. They may cover any phase of the problem whether concerning joint design, fabrication or laboratory investigations.

The contest is open to any resident of this country without restriction.

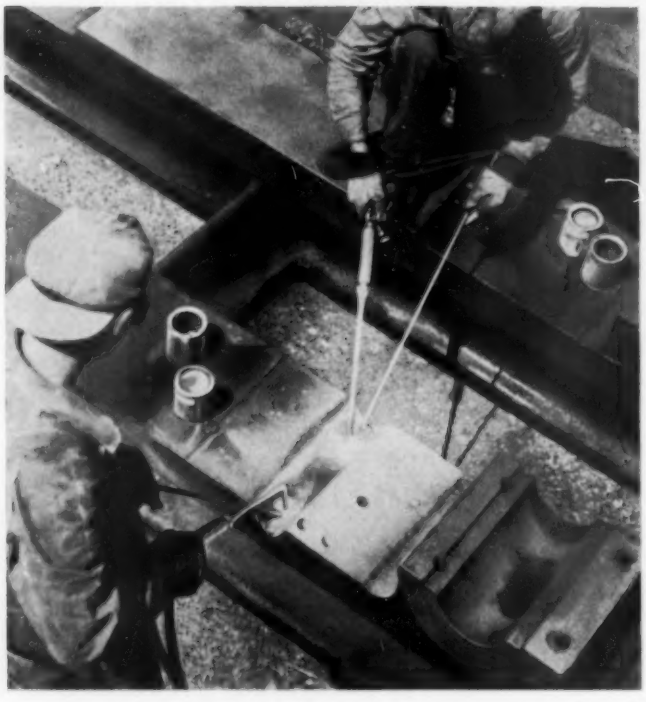
Papers must be submitted not later than August 18, 1941, to the Aircraft Welding Contest, American Welding Society, 33 West 39th Street, N. Y.

The Committee of Awards of the American Welding Society, with the addition of two men associated with the aircraft industry, will constitute the judges. The decision of the judges will be final.

Papers submitted in the contest may, at the discretion of the American Welding Society, be included in its next annual program or be published in *Welding Journal*.

All papers must be typewritten, single spaced, written on one side only of blank white paper. Photographs, charts, graphs, etc. may either be attached directly to the copy or may be detached, in which case they should be clearly identified.

★MAINTENANCE



BRAZING— FOR

Fig. 1 — Brazing is used in repairing a 6-ton cast iron bed frame for an upsetting machine.

KEEPING DOWN repair costs, maintaining equipment in condition for high operating efficiency, and having machines ready for service when required are major problems in all industrial plants. Scrap piles represent not only the los of tangible assets but also reduced production time resulting from each shutdown for replacements. The maintenance shop consequently holds a key position in efficient plant management for it often happens that a company can trace back to its operations a sizeable part of each year's profits.

Brazing Advantages

Plant maintenance men have in brazing a repair and fabrication method that is speedy and economical in operation, and readily available to all parts of the plant, since, as in the case of all oxy-acetylene welding processes, the equipment used is readily portable.

No other joining method can quite equal the general all-round usefulness of brazing, due to the readiness with which bronze weld metal will form a bond of excellent strength with a large number of metals that have a higher melting point, including such diversified metals as cast iron, steel, nickel and monel metal. Although the base metal is not actually melted in brazing, the unique characteristics of the bond between bronze weld metal and base metal give a joint that is comparable to a fusion weld. This wide applicability of brazing is of obvious importance in plant maintenance where practically all commercial metals are encountered.

As an additional advantage, it is seldom necessary to preheat above a "black" heat for any brazing application. Those who are familiar with fusion welding of castings or large and complicated objects realize this means a considerable saving. The usual requirement is to remove the chill and bring the part to black heat before starting to brazing operation. Small parts can be preheated locally with the oxy-acetylene flame, while large parts are usually prepared for welding by the use of a simple preheat furnace.

To these advantages can be added that of the inherent economy of brazing itself, as compared with other welding methods. The relatively low heat input necessary to cause the flow of bronze weld metal onto a properly heated and fluxed surface results in a minimum consumption of gases.

Welding Rod and Flux

Inasmuch as joint strength depends so greatly upon the weld metal, the quality of the welding rod and flux that are used is of great importance.

Recent years have seen a number of developments, among them being the development of an all-purpose bronze welding rod which contains silicon, in addition to the alloying elements of tin, iron, and manganese. This element, silicon, performs several important functions that are of value to the welding operation and that make silicon-containing rods distinctly different from other bronze welding rods.

In the first place, as in steel, silicon functions as a deoxidizer, there-

A TOOL PLANT MAINTENANCE

W. S. WALKER
Manager of Process Service
Linde Air Products Co.

★ Part 1—Brazing is excellent for maintenance purposes. It is a suitable method for joining many different kinds of metal. The rods, fluxes and technique to be used are discussed.

by removing oxides of tin, copper, and zinc and replacing them with silicon dioxide which floats readily to the surface of the molten weld puddle to unite with the usual brazing fluxes. Secondly, silicon causes any gases that are dissolved in the metal at high temperature to be retained in solution during solidification instead of being thrown out of solution to form bubbles, as happens when the silicon-free alloys solidify. The result of this is that the weld metal is free from porosity and blowholes and, as a consequence, has greatly increased strength and machinability. A still further advantage of adding silicon to bronze welding alloys, of particular importance to the weldor, is the fact that, due to the presence of the film of slag over the surface of the molten puddle, the fuming and oxidation of zinc are greatly retarded.

The all-purpose welding rod containing silicon will consistently give welds in the usual grade of steel tank plate with a tensile strength of over 55,000 lb. per sq. in., and in many cases the bronze-welded joint strength has been over 60,000 lb. per sq. in. The ductility for this special bronze rod is in excess of 30 per cent.

Due to the soundness and excellent wearing quality of the weld metal afforded by this rod, surfaces built-up with it are found to possess increased resistance to wear. The average Brinnell hardness value for this rod is about 96. Because of the soundness and freedom from porosity, welds can be machined to give a surface entirely free from blemishes after the finishing cut, which is an exceptional advantage for wearing surfaces. As a result of the carefully balanced content of deoxidizing and reducing agents in this rod, it is remarkably free-flowing and lends itself very readily to the sectional building-up of large deposits, where successive layers are added one after the other.

Another bronze rod has been developed especially for building-up wearing surfaces that will be subject to pounding and wear at elevated temperatures. This rod has lower ductility than the all-

Fig. 2 — Brazing is used here to an advantage to close an opening in an obsolete still section made of copper plate.

purpose rod but the increased hardness so desirable in a bearing bronze.

Brief mention of course must also be made of the importance of using the proper flux in bronze-welding. The use of such a flux provides the chemically clean surface on the base metal which insures an intimate molecular union or bond between base metal and bronze weld metal.

Metals That Can Be Brazed

The all-around usefulness of the brazing process is particularly evident when considering the wide range of metals that can be joined by it. These include cast iron, malleable iron, carbon steels, alloy steels, wrought iron, galvanized iron or steel, sheet metal, copper, brass and bronze, nickel and Monel Metal.

Cast Iron

Brazing is particularly well adapted for welding cast iron. As it does not require melting of the base metal, the considerations which are necessary to insure the proper gray iron structure in a fusion weld are completely eliminated. Because of the lower temperature required, preheating is greatly simplified, preheating of the entire casting seldom being required. The use of only local preheating at a relatively lower temperature makes it possible in many cases to effect repairs to broken machines in place, thus saving the time and expense of dismantling and reassembly.

Malleable Iron

Brazing has always been the only practical method of repairing malleable iron. Malleability is developed by a special and lengthy heat-treatment and consequently, fusion welding is unpractical because it destroys the malleability. Malleable iron castings can be repaired to give strong and lasting joints by brazing, however, because the relatively low temperatures of bronze-welding do not affect their malleable properties.

Carbon Steels, Alloys Steels, and Wrought Iron

The brazing of low-carbon, medium-carbon, and high-carbon steels and wrought iron is an application of bronze-welding with many possibilities. With the all-purpose bronze rod, weld strengths of 55,000 to 60,000 lb. per sq. in. in steel can be obtained easily.

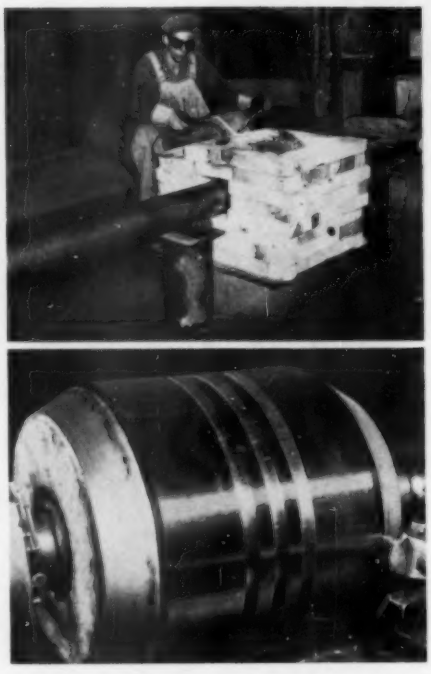


Fig. 3—(Upper) The reclamation of compressor pistons is standard practice in many gas plants. After preheating in the temporary furnace, the cylinder was evenly built-up with bronze metal to a diameter ⅛ in. oversize to provide sufficient metal for finish-machining.

Practically any of the various alloy steels can be satisfactorily bronze-welded, since the low heat of application is not sufficient to affect materially the properties of alloy or heat-treated steels. Brazing should not, of course, be used for any steel parts that require heat-treatment after welding.

Galvanized Iron or Steel

Brazing is a highly useful method for joining galvanized iron or steel because it has so much less effect on the galvanized coating than do other welding methods. In making a bronze weld on a galvanized part, the surfaces forming the vee are always kept well below the fusion temperature, and the heat has only a localized effect on the galvanizing coating. Although the galvanizing coating may be completely removed from the abutting ends for a short distance, perhaps ⅛ in. or $\frac{1}{16}$ in. on each side of the center of the joint, in many instances a thin film of bronze spreads along this area, inside and out, much as solder spreads on a properly tinned surface when the heat is right. This spread of bronze protects the edges even though a little of the galvanizing may be removed completely. Experience has shown that brazed joints in galvanized material are fully as corrosion-resistant as the rest of the material under most service conditions.

Sheet Metal

Sheet metal can readily be brazed with a minimum possibility of distortion and warping, due to the comparatively low input of heat during welding.

Copper

Probably the most popular method for joining copper is by brazing. It is generally recommended that copper be bronze-welded except in cases where an absolute color match is desired, or where bronze weld metal will not meet certain service requirements, such as corrosion-resistance. For full-strength welds the copper base metal should be deoxided copper.

Brass and Bronze

Brazing is widely used for joining brasses and bronzes that have a higher melting point than that of the bronze welding rod.

Nickel and Monel Metal

Nickel and Monel Metal can readily be welded by brazing, provided one consideration is taken into account. This is the fact that nickel and Monel Metal have a range of relatively low tensile strength and brittleness between the temperatures of 1,375 to 1,600 deg. F. Above and below this range they regain their normal strength and ductility. It is obvious that the expansion and contraction must be handled carefully to see that there are no stresses existing while the base metal is in this range. Mainly this is accomplished by permitting the weld metal to expand and contract naturally instead of holding it rigidly to prevent contraction.

Joining Dissimilar Metals

The fact that molten bronze will flow onto the heated surface of a higher melting point metal to give a strong bond makes the brazing process ideally suited for the joining of dissimilar metals, such as malleable iron or copper to iron or steel.

(Part 2 will appear in April, 1940 The Welding Engineer)

Multiple Spot Welding Speeds Production

★ The flexibility of multiple station spot welders and the capabilities of this machine as a production tool are discussed. Its use in the fabrication of metal frame materials are described.

THE INCREASED demands for Stran-Steel members for National Defense housing needs has resulted in the installation of two new multiple spot welding machines in the Jackson, Mich., plant of the Stran-Steel Corp. One of these machines is pictured in Figure 1. This new equipment, which possesses the required flexibility to handle the numerous combinations of Stran-Steel sizes, shapes, at a production rate of 2400 lineal ft. per hour. This speed places the fabrication of such material on a mass production basis and is a vast improvement over the previously riveted and later single machine spot welded means of fabrication.

Twelve Welding Guns Used

The entire line of Stran-Steel joists, studs, half studs, and narrow studs, are made of light gauge copper bearing steel sheet. This sheet is first formed into angles or channels and then so joined as to provide a nailing space along the entire length of each member. The projection formed by bubbles stamped at regular intervals along one half of the completed section provides this nailing space.

The new spot welding machines are identical, each employing twelve vertically opposed sliding contact guns (Fig. 2) and six welding transformers, one for each spot weld made. An air-hydraulic booster with a large reservoir and high pressure capacity is air actuated to supply sufficient hydraulic pressure for the simultaneous operation of the 12 guns. So as to accommodate any of the various width Stran-Steel members, provision has been made for adjustmenting the distance between guns on each side. Guns also may be moved for the proper spacing between spots longitudinally. These features together with the provision for cutting out the guns on either side, permits the machine to be used for welding the half stud members makes each machine capable of welding any of the various Stran-Steel sections.

Inasmuch as the joists are made of varying gauges to meet different strength requirements, the welders have been fitted with adjustable means of varying pressure, time, and current for the 11, 12, 13, 14 and 16 gauge sheets used in joist fabrication.

Various Capacities

Indicative of the versatile capacities of such welding machines is the wide range of sizes handled: Web widths of members vary from about 2½ and 3½ inches for narrow stud and standard stud, respectively, to 9 inches for the joist. Half studs, made up of two angle sections and welded with one set of guns only, are about 2 in. in overall web width. Flange widths for all members are 2 in.

Fig. 1 — One of two spot welding machines capable of spot welding a total of upwards of 2400 lineal feet of Stran-Steel framing members per hour. It employs twelve vertically opposed sliding contact guns short-coupled with six transformers mounted in the base and sides of the machine.

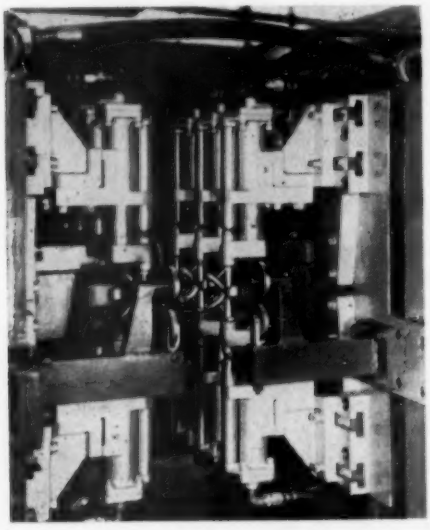


Fig. 2—Series of guide and rest rolls align the work during welding while twelve sliding contact guns weld simultaneously.

While most of the members (studs) are made of two channel sections welded together to form an I-beam section, the joists are made up by welding two angles to a single channel section. The operation for manufacture of both types is identical with only the preparation for welding being different.

Assembly of the sections preparatory to welding is done by the welder's helper who places the angles (in the case of the joists) in position and clamps them. The clamped assembly, usually measuring some 30 feet in length, is then started through the welding machine. The section is pushed through until the first nailing bubble on each side of the section is in position at the first welding gun station, a weld is made with the "C" clamps are removed.

When the work is placed in the welding machine, the section having the bubbles is on the under side. As the part is moved through the machine, these bubbles drop onto the rolls thus positioning the work for welding (Fig. 3).

One set of small rolls mounted inside the two rows of guns supports the work midway between the upper and lower welding points. These rolls also serve to locate the position of the spot welds which are made through each bubble in the member. Another set of rolls positions the work laterally.

The three bubbles on each side of the section are then positioned for welding by the three sets of guns. The operator closes the pilot and the twelve guns come together on the work making the six welds (three on each side of the section) simultaneously. This is repeated until the entire section has been welded. The section is then cut to required length and are ready for use in home construction.

THE END

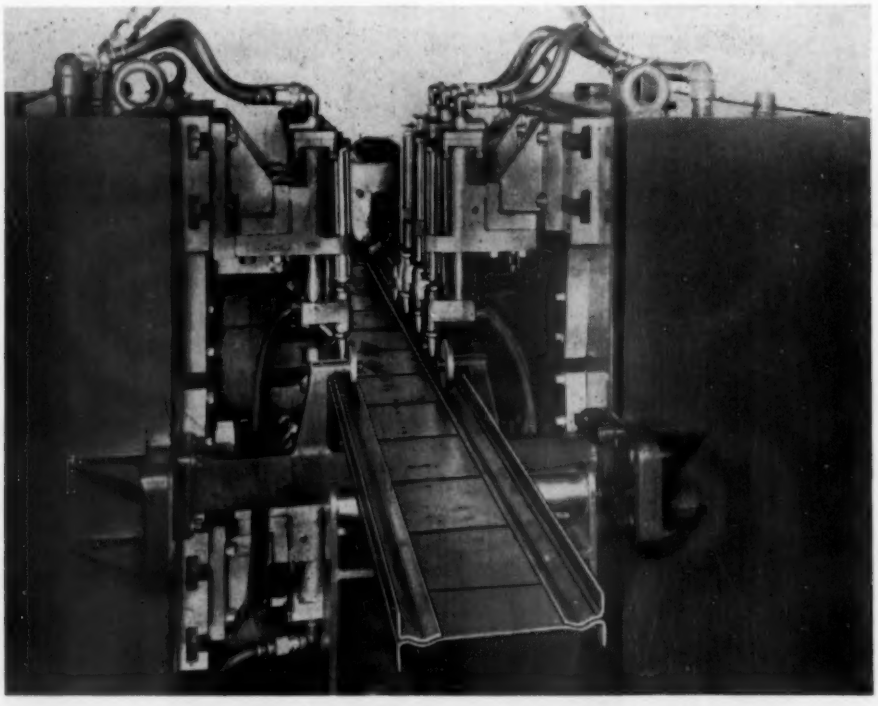


Fig. 3—Welds are located when bubbles, in the underside of the channel section, drop onto guide rolls. Adjustment for various width shapes as well as for distance between welds is provided. (All photos by Progressive Welder Co.).

Western Metal Congress

With the western branch of the American Welding Society co-operating in the general scheme and scheduled to offer a complete program of its own, the Western Metal Congress and Metal Exposition will be presented by the American Society for Metals May 19 to 23 in Los Angeles. Technical sessions will be held in the Biltmore Hotel and Pan-Pacific Auditorium. The exposition is set for the Pan-Pacific Auditorium.

Expectations are that 50,000 manufacturing plant operators, superintendents, production men, engineers, purchasing agents, metallurgists and metal workers will attend.

A. G. Zima, general chairman, said the theme of the congress and exposition will be "new aids to production," a demonstration of progress to increase quality, economy and speed in the part the metal industry will play in the national defense program.

The finest technical program yet presented before a Western Metal Congress is reported being arranged by Dr. D. S. Clark, program chairman. Mr. J. C. Gowing, is assisting Dr. Clark on program arrangements and is in direct charge of the program to be present at the A. W. S. Technical Sessions.

More than 75 per cent of the exhibit space has been allotted, according to Mr. Eisenman, Exposition manager, and a keen demand for the balance is seen.

"This assures," he said, "that virtually all of the 60,000 square feet of the show will be occupied by new aids to production. These will be installed by leading metal producers, fabricators and manufacturers of heat treating, welding, machining and testing equipment, all of which will be used in the prevailing program to arm America for defense."

Western sections of national technical societies will co-operate in the Congress and Exposition. These societies are: American Ceramic Society, American Chemical Society, American Foundrymen's Association, American Institute of Electrical Engineers, American Institute of Mining and Metallurgical Engineers, American Petroleum Institute, American Society of Civil Engineers, American Society for Testing Materials, American Society for Metals, American Welding Society, California Gas and Oil Association, Institute of Aeronautical Sciences, Liquified Petroleum Gas Association, Metal Trades and Manufacturers' Association, Mining Association of the Southwest, National Purchasing Agents' Association, Pacific Coast Electrical Association, Pacific Coast Gas Association, Society of Automotive Engineers and Wire Association.

★PRODUCTION

PROGRESSIVE REDESIGN OF SUGAR GRANULATORS LOWERS COST*

by
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Hersey Mfg. Co.
So. Boston, Mass.

★ Gradual changes to welded design has resulted in improved and more efficient sugar granulating equipment. These changes are described and the resulting lower manufacturing cost explained.

SUGAR GRANULATORS have been improved in design and construction many times during the sixty years of their manufacture but probably no improvement, from a cost and convenience standpoint, has paid better returns than the substitution of arc welded fabrication for cast iron or riveted steel. In order to comprehend the extent to which arc welding has taken over the construction of our granulators, reference should be made to Fig. 1 which shows a granulator in outline. Noted on the drawing are the points at which arc welded steel has replaced some other material or construction.

These changes were started first in the buckets which were welded instead of riveted in the granulators that went to the Mexican Government's first large co-operative refinery at Zacatapec. The remaining changes were made from this timid start for welded construction revealed substantial savings in shop cost and improvement in design. These sugar granulators are now as completely arc welded construction as far present knowledge permits.

As previously stated the first change made was from riveting to welding in securing the buckets to the granulator shell as shown in the drawings in Fig. 2. The removing of this flange not only saved 740 lbs. of steel per granulator, but also eliminated the necessity of punching and bending the flange. This change resulted in an improved design because the bucket is now attached to the shell with a continuous weld which leaves no crevice in which sugar may lodge.

Comparative costs of the two types of bucket are as follows:

Riveted Buckets		Welded Buckets	
2420 lbs. ⅛-in. Steel	$ 79.86	1680 lbs. ⅛-in. steel, welding electrodes, welding 24 hrs., helping 15 hrs., burden 29 hrs.	
33 lbs. ⅜ x ½-in. Rivets	4.95		
Punching 8 hrs.	4.80		
Bending 13 hrs.	7.80		
Riveting 23 hrs.	26.45		
Burden 67 hrs.	51.59		
	$175.45		$146.02

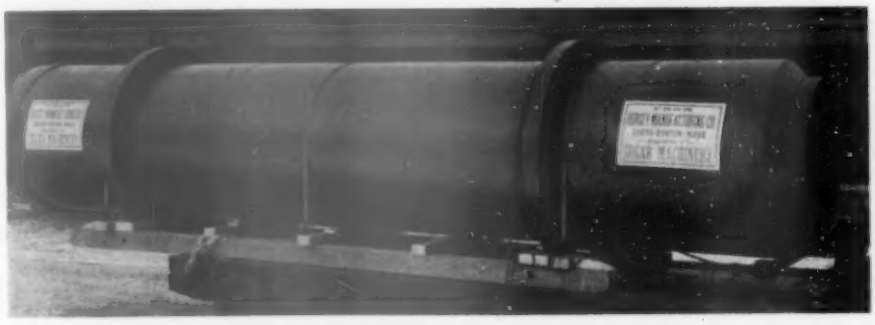


Fig. 1—A special sugar granulator made of stainless clad steel arc welded.

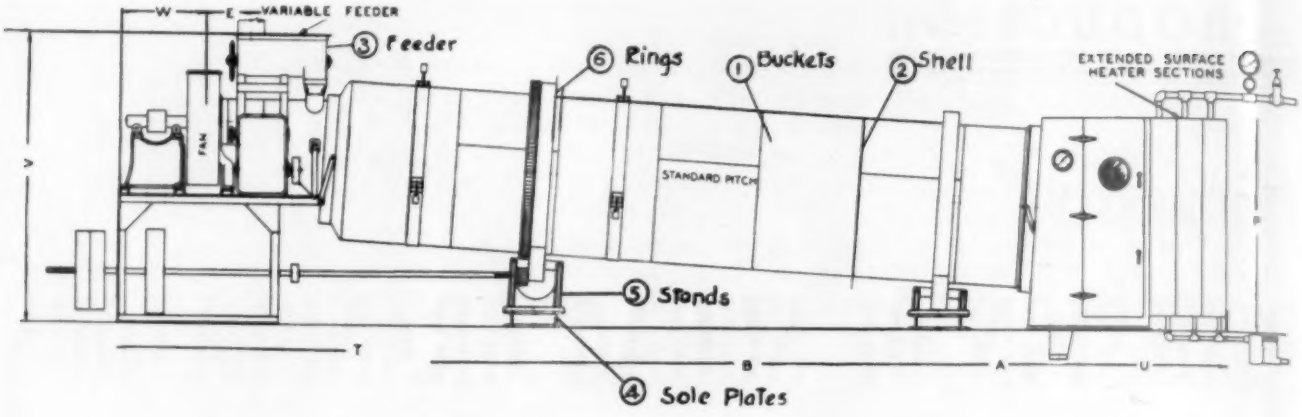


Fig. 2—Outline sketch of sugar granulator showing parts arc welded.

The saving per granulator because of this construction change is 16¾%.

Butt Welded Shell

Changing from lap riveting to butt welding the shells was the next logical step although the riveted construction could not be entirely abandoned. Since sugar granulators are shipped to the far corners of the earth and because the shells cannot be handled in one piece on many steamships and few of these far away sugar factories are equipped for arc welding, it is still necessary to construct some exported granulators riveted to be shipped knocked down.

Comparative costs of 6 ft. x 23 ft. granulator shells:

Lap Riveted Shell

2338 lbs. ⅛-in. Steel	$ 93.52
40 lbs. ⅜ x ½-in. Rivets	4.80
Punching 28 hrs.	30.80
Rolling 3 hrs.	3.45
Riveting 60 hrs.	66.00
Burden 182 hrs.	140.41
	$338.98

Butt Welded Shell

2198 lbs. ⅛-in. Steel including welding electrodes, rolling 3 hrs., welding 10 hrs., Assembling 30 hrs., Burden 113 hrs. $265.38

The saving per granulator is 21¾% by welded fabrication.

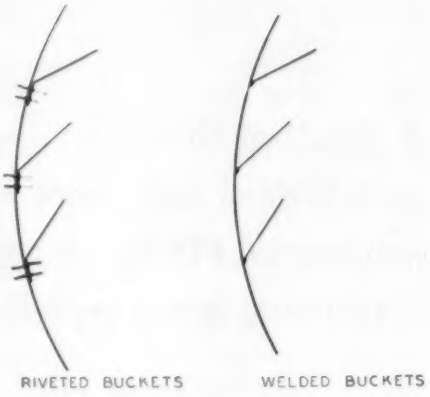


Fig. 3—Riveted and welded joints in bucket of granulator.

A special granulator built of ¼ in. stainless clad plates butt welded is shown in Fig. 3.

The third change in design to welded construction was made in the granulator feeder which is a special scroll driven through a variable-speed device. For many years the scroll was enclosed in a cast iron tank. This was not only a heavy unit, but awkward to handle and costly to build. The new construction makes use of a completely welded tank with cartridge ball bearings mounted clear of the tank to prevent leakage of oil into the sugar. These bearings replaced babbitted bearings plugged with graphite. The welded feeder presents many advantages in that it is much lighter, less expensive and requires less power and in addition it is not subject to breakage caused by vibratory shock or stresses.

Comparative costs indicate that a saving per granulator of 22½% is possible by using welded instead of the conventional cast iron construction. The costs are:

Cast Iron Feeder Tank

315 lbs. Cast Iron	$ 26.78
14 lbs. Babbitt	3.15
¼ lb. Graphite Plugs	.75
28 Capscrews	2.03
Building 60 hrs.	39.00
Burden 77 hrs.	46.20
	$117.91

Welded Steel Feeder Tank

Sheets and L's as cut, Bearings, 8 Bolts, Building 40 hours, Burden $91.47

Tread Ring

The next change was in the tread ring. The outer or tread part of this two-piece ring has for many years been cast in steel but a high perecentage of unsound or misshapen castings and a growing confidence in the ability to design and fabricate welded steel construction prompted the new design. This ring is made from standard flats furnished by the steel mill, rolled in half circles, to the correct radii. They are made in halves to facilitate removal from the granulator shell for refinishing. The ends of the two half circles forming the inner part are first squared off so that the complete circle may be assembled on the boring mill to scarf the edges for welding. After the welds are completed the ends of the half circles are milled square, bolted and dowelled together and the completed ring is then finished to size.

The improvement in this part is chiefly in cost (27½% saving) and appearance. There is no gain in strength and but little saving in finished weight.

Comparative costs are as follows:

Cast Steel Rings

3200 lbs. Cast Steel	$400.00
Machining	122.40
Helping	16.00
Burden	163.24
	$701.64

Welded Steel Rings

2800 lbs. Machine Steel rolled to radius, Welding 32 hrs., Machining, Helping, Burden	$509.44

The result is a lighter, stronger and less expensive design. In this case comparative costs are for stands only and do not include wheels, frames or bearings. They follow:

Cast Iron Stands

1980 lbs. Cast Iron		$168.30
Planing	22 hrs.	14.30
Pulling and Tapping	4 hrs.	2.60
Helping	5 hrs.	2.50
Burden	31 hrs.	23.87
		$211.57

Welded Steel Stands

Steel as billed (cut to shapes), welding electrode, welding, helping and burden	$163.86

A sugar granulator is rotated on running rings borne on suitably mounted truck wheels. The truck wheel stand construction used for many years was changed to new designs that make use of a single wheel, as well as the double wheel and swing frame. The sole plate was first changed from cast iron to a welded ship channel unit but later the entire design was changed.

The difference in construction cost represents a saving of 22½% per granulator.

In addition to the definite changes in design to make use of arc welded steel fabrication, there are many other places in these granulators where change in design were required by increased knowledge of drying. The feed end design has ben entirely changed and the feeder and fan are carried on a structural steel frame. Before making use of welding, this frame would have been riveted. It is, of course, welded and the drafting room and shop time of laying out the holes has been eliminated as is the operation of drilling or punching. In all, the use of welded construction has resulted in the overall saving per 6 ft. x 23 ft. granulator on material, labor and direct burden—in other words, "shop cost" of 24%.

Intangible Savings

The tangible savings have been set forth but there are in addition three values, though intangible, that should be included in a just appraisal of the value of arc welding for sugar granulators. These are (a) elimination of lost time due to bad castings, (b) light weight parts save handling costs, and (c) the sales value of an improved design.

* Data and illustrations from award study submitted to the James F. Lincoln Arc Welding Foundation. In its $200,000 Industrial Progress Award Program, which closes June 1, 1942, the Foundation is offering 458 awards from $100 to $13,700, for reports of advances and improvements made by application of arc welding in design, manufacture, fabrication, construction and maintenance.

Production Data Given on New G-E Label

In introducing a brand new service idea to the welding industry the General Electric Co. now places on each box of welding electrodes a "Production Label." This label is designed to help users, welding supervisors, and stock clerks in that it shows the weight of deposited metal obtainable from the 50-lb contents of each box as well as the length of typical fillet welds that can be made. This new help is expected to make it easier for all concerned with welding processes to estimate costs and requirements, and to give welding operators standards or typical welds against which they may check their own results.

GENERAL ELECTRIC
ARC WELDING
ELECTRODES
TYPE W-20
SIZE 1/8" X 14"
SCHENECTADY, N. Y.
PRODUCTION DATA
This 50 lb. box of electrodes will produce 32.4 lb. of filler metal in joint, lapped on 2" stub ends.
Welding production is estimated as follows:

Production data on the label makes it easy to determine what might be expected from 50 lbs. of electrodes.

Lamme Medal Awarded to Comfort Avery Adams

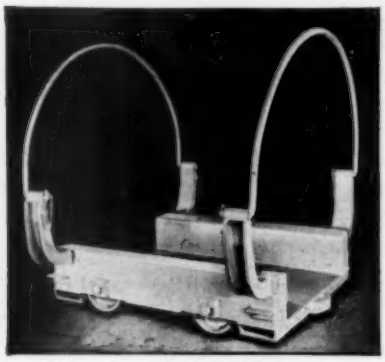
The 1940 Lamme Medal of the American Institute of Electrical Engineers has been awarded to **Comfort Avery Adams**, Consulting Engineer, Edward G. Budd Mfg. Co., Philadelphia, Pa., "for his contributions to the theory and design of alternating current machinery and his work in the field of electric welding." The medal and certificate will be presented to him at the annual Summer Convention of the Institute, which is to be held in Toronto, June 16-20, 1941.

The Lamme Medal was founded as a result of a bequest of the late Benjamin G. Lamme, Chief Engineer of the Westinghouse Electric & Mfg. Co., who died on July 8, 1924, to provide for the award by the Institute of a gold medal (together with a bronze replica thereof) annually to a member of the American Institute of Electrical Engineers, "who has shown meritorious achievement in the development of electrical apparatus or machinery" and for the award of two such medals in some years if the accumulation from the funds warrants. A committee composed of nine members of the Institute awards the medal.

Brief Sketches of Welding Jobs

Welding Improves Tie Car

★ Allis-Chalmers Mfg. Co., Milwaukee, Wis., have designed a newly improved, all-welded tie car for their standard 8 ft. wood preserving pressure cylinders. The car is built for standard gauge track and is equipped with Timken roller bearings. The all-welded design affords the maximum possible loading capacity with a minimum waste of treating space inside the pressure cylinder. In addition maintenance costs are reduced and lighter weight construction is obtained.



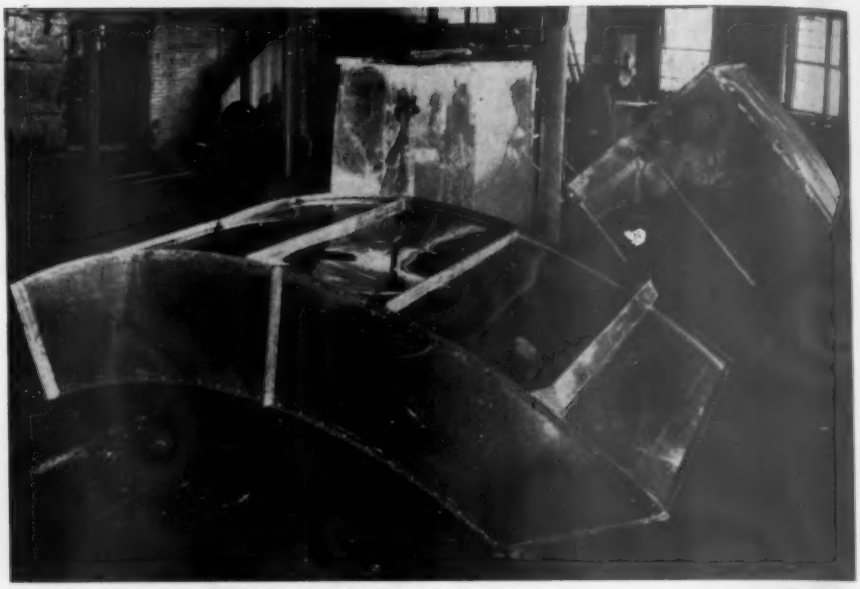
Maximum loading with minimum waste.

Welded Coal Hopper

★ Appearing as a huge morning glory, the structure illustrated is a conical hopper bottom used in coal loading machinery for steam locomotives. It is 12 ft. 6 in. in diameter, 8 feet high with a 20-inch opening at the bottom.

Its fabrication consisted of bending ¼-in. mild steel plate into the 89 segments, then fusing the components together by arc welding. The rim of the structure consists of four pieces of ¼ in. plate, 10 in. wide, arc welded to the ends of the segments and joined together by butt welds.

93 pieces of plate were required for this conical hopper. (Photo Lincoln Electric Co.)



Aluminum welding without loss of gloss effect. (Photo Lincoln Electric Co.)

Aluminum Conveyor Construction

★ Aluminum arc welded without any disturbance to the glossy finish is the problem of the Standard Conveyor Co., North St. Paul, Minn., builders of an aluminum conveyor and hopper for a large rubber company in Akron, Ohio. The success of the operation may be determined from the reflections on metal surfaces in the above illustration.

This is just one of the many problems confronting the fabricators because of rigid specification requirements. The problems of welded fabrication, however, are never too difficult to be overcome and as a consequence welding is rapidly becoming the most popular means of fabrication where quality products are desired.

The framework consists of 2 in. x 2 in. angles and the sheets are 10 ga. aluminum. Using welded construction assures water-tightness in all seams. Because of this the work contains 300 ft. of welding. The welding was done with a 5% silicon aluminum alloy shielded arc type electrode. It was possible to polish the welds with virtually no discoloration.

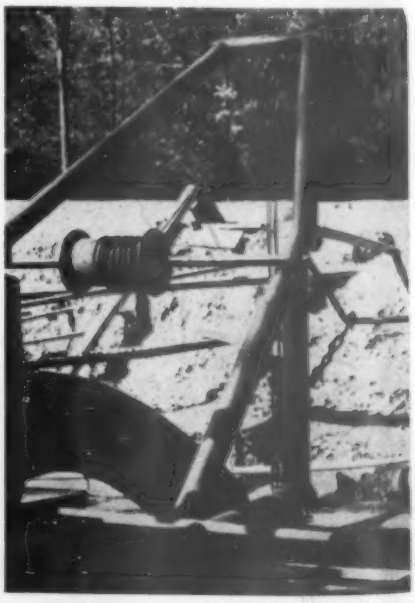
In welding this conveyor and hopper unit, the operator held a short arc, with the coating of the electrode approximately touching the molten pool of metal. The highest current possible, without melting the edges of the metal excessively or burning through, was used. The welding arc was directed so that both edges were properly and uniformly heated. Rate of advancing the electrode along the seam was such as to assure a uniform bead.

Welded Frame Carries Hose Hoist

By M. T. Pate

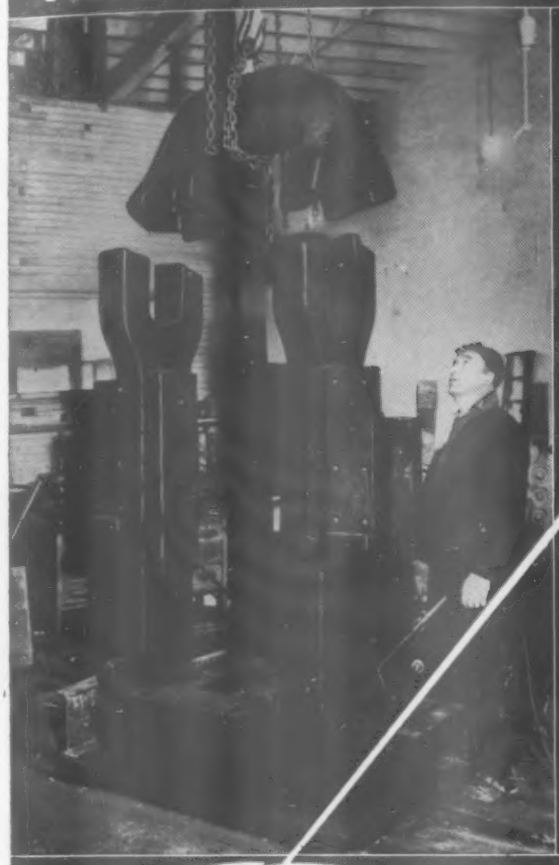
★ The necessary winch for quickly adjusting the height of a pump suction hose was secured by welding a frame to the end of the pump skids. Ears were welded on the frame at the proper height to carry the shaft of the drum which was made by two discs cut from tank plate on the end of a short piece of six-inch pipe.

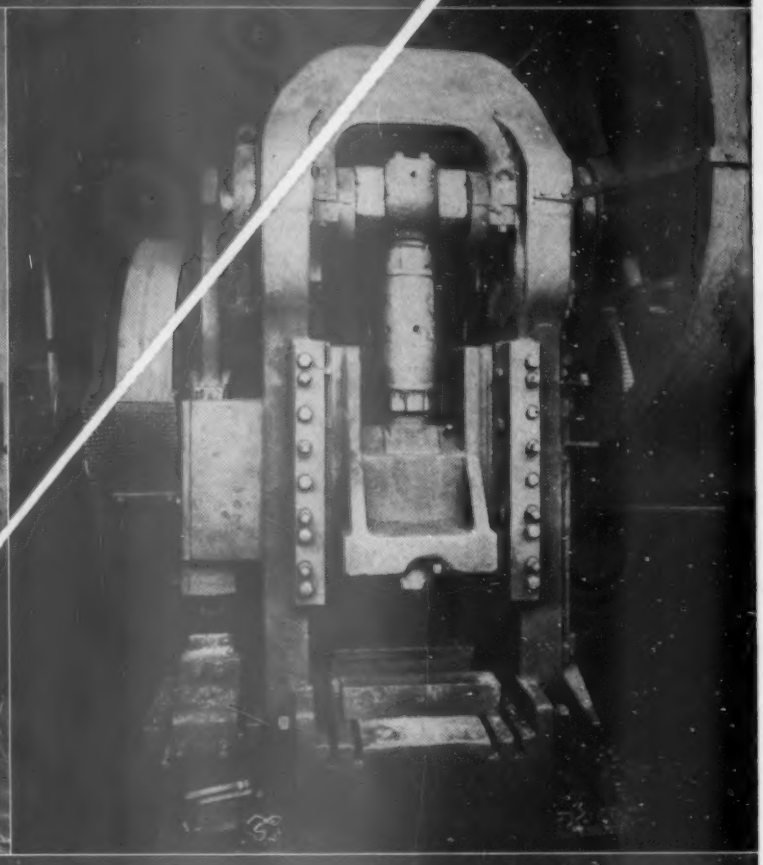
By welding the lifting unit to the pump skid, a number of otherwise bolted joints are eliminated. This feature also insures the arrival of the hoist with the pump when the pump is to be set up at a new location.



An effective hoist frame for an oil field pump.

FROM THIS — TO THIS





IN 46 HOURS!

Thanks to Anaconda 997 Low Fuming Welding Rod

WHEN the Hebeler Welding Company of Buffalo, New York, were called in on this emergency job, they took one look at the fractured 4½-ton punch press; promptly recommended repair welding with Anaconda 997 Low Fuming Rod . . . a high strength, tough weld metal with low fuming characteristics.

The job consumed 160 pounds of filler rod and 1,600 feet of both oxygen and acetylene. Chipping, preheating with natural gas and compressed air and other preparation required 35 hours; welding, 11 hours. The result was a strong sound weld and a happy production manager, for the downtime loss was only a fraction of what he expected.

Next time you're faced with a similar emergency, bear this story in mind. Anaconda Rods are produced in an extensive line of alloys for all kinds of welding. You can obtain them from your jobber. 49119

ANACONDA from mine to consumer

Anaconda Welding Rods

THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Connecticut

In Canada: Anaconda American Brass Ltd., New Toronto, Ont. • Subsidiary of Anaconda Copper Mining Company

Brief Sketches of Welding Jobs

Largest All-Welded Crane Trolley

★ What is believed to be the world's largest all-welded crane trolley frame is under construction in the plant of the Cleveland Crane and Engineering Co., Wickliffe, Ohio. This trolley frame is for a 150-tons capacity heavy duty Cleveland steel mill type crane.

The frame alone will weigh 32½ tons and have an overall length and width of 23 feet 5 inches by 15 feet 6 inches. 276 pieces of various thicknesses varying from ⅜ inch to 2 inches are being welded together.

After the frame has been welded into a one-piece unit it will be accurately machined in the same manner as a huge casting. By machining the frame as a whole rather than in individual sections, perfect alignment and proper bearing seats and fits are assured.

The crane for which this trolley frame is being built is one of three duplicates to be used in connection with heavy defense work.

A 32½ ton frame is required for the world's largest all-welded crane.

» «

When you need RODS for Special Applications

Call Ryerson

Large stocks include McKay Certified Stainless Electrodes, Alloy, and Hard Surfacing Rods.

For sound, strong, dependable welding jobs, choose Ryerson Rods—they're tops for speed, economy, and performance.

McKay Stainless Electrodes—carried in stock at 10 conveniently located Ryerson plants — lower fabricating costs . . . leave cleaner, smoother deposits . . . penetrate deeply . . . and have low spatter loss. Certified weld deposit analysis is stamped on each package — a definite advantage over core wire analysis which is often changed considerably in actual welding. The type is clearly die-stamped on each rod. Large stocks of many types and sizes assure prompt reliable service at all times. Write for bulletin. Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON

New Products

Heavy Duty Sanders

★ Two new compact Sanders have been announced by the Stanley Electric Tool Div., New Britain, Conn. to work on the tough and difficult production and repair jobs. Their mechanical features are strong aluminum alloy housings, dust and dirt free seal type ball bearings on armature and spindle, heavy duty nickel steel precision spiral gears, totally enclosed double pole switch, powerful ventilated Universal motor.

It can grind or sand welds.

When used with flare cup grinding wheels these Sanders are claimed to be suitable for smoothing welds and surfaces where considerable metal is to be removed.

Sander No. 72 with a 7 in. dia. disc has a speed of 4200 r.p.m. Weight 17¼ lbs. **Sander No. 92** has a 9 in. dia. Disc and a speed of 330 r.p.m. Weight 18 lbs. Both have Universal type motors which operate on either D.C. or A.C. current. Available in 115, 125, 150, 220, 230 or 250 voltages.

» «

Multiple Operator Welder

★ A new 2,000 ampere multi-purpose-arc welder for all heavy-duty applications has been announced by **Glenn-Roberts Co., Inc.** Known as the **G-R Model 85** and is designed to operate either as a single-circuit welder with a current range of 100-2000 amperes, or as a 2, 3, or 4-operator multi-circuit ma-

chine. Each of the four welding circuits has an independently-controlled output range of 90-625 amperes, and any combination of lines may be made to gain higher amperages.

Of interest is the remote control equipment which provides stepless, full-range current control for each circuit or combination from a push-button station located anywhere in the welding work area, or mounted directly on the flare shield of the welding tongs. Self-contained contactors and switches are included for automatic and Union-Melt welding. Built in accordance with NEMA standards, the Model 85 is said to offer such features as precision core plates die-stamped from low-loss silicon transformer steel, heavy structural steel transformer frames and bases, fibre glass and mica insulation throughout, and complete protection against deterioration or failure from moisture and heat. Complete specifications and data on the welder may be obtained by writing to Sales Department, Glenn-Roberts Co., Inc., 1009 Fruitvale Avenue, Oakland, California.

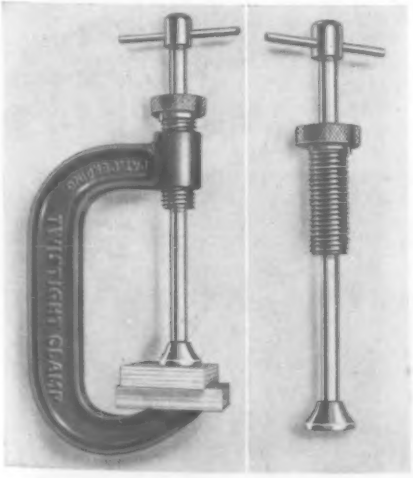
» «

Weldor's Clamp

A new type "C" clamp and pressure unit are being offered by the Mechanics Engineering Co., Jackson, Mich., under the name of the **"Twistight Push-Pull C-Clamp."**

The mechanism is simple and wear-proof, consisting of rolling clutch inside of a screw barrel which grabs the smooth rod so that the foot of the clamp may be instantly adjusted to any thickness of material to be held. A turn to the left and a pull opens the clamp to its full capacity and a push and turn to the right locks it, and a half to a full turn applies the pressure.

The clamp is claimed to be particularly adapted to welding as the sliding rod and the swivel foot are made of Everdur metal to which spatter does not adhere, thus completely eliminating the trouble of spatter sticking to the threads as on regular type "C" clamps.



A simple twist tightens this clamp.

» «

Brazing Alloys

★ Low-temperature brazing alloys are now being manufactured and distributed in this country by **Eutectic Welding Alloys, Inc.**, 40 Worth Street, New York. This company has acquired exclusive license in the United States to commercialize the **Castolin low-temperature welding and brazing products** formerly imported into this country from Switzerland.

In making the weld the flux, which is in paste form, is applied by a brush to the sections to be joined. It then is heated by the torch flame, and as soon as it becomes molten the rod is applied. The latter flows evenly over the pre-heated area, a characteristic of the alloys being their ability to flow easily into various types of joints.

Fusion of the molten rod with the heated surface and complete penetration and diffusion by capillarity inside the welded metal are claimed for this type of weld. High tensile strength; reduction in warpage and elimination of oxidation of the parent metal, increased welding speed and low gas consumption because of low temperatures employed, and a smooth joint which requires little clean-

Titan Provides the Correct Alloy

FOR EVERY OXY-ACETYLENE BRONZE-WELDING PURPOSE

TITAN Welding Alloys are all scientifically designed, alloyed and fabricated to produce the best possible results for purposes recommended. TITAN Alloys are exceptionally low-melting. Uniformity is assured by rigid laboratory control. *Double deoxidation increases the ductility of the weld, reduces fuming to a minimum and assures a sound, dense deposit.*

TITAN Alloys are furnished in three distinct groups:

- **MUNTZ TYPE: General Purpose Rods, for High-strength Ductile Welds.**
  PENN BRONZE, doubly-deoxidized, low-fuming; flows at 1628°F.
  TITAN BRAZING BRONZE, flows at 1625°F.
- **TIN BRONZES: Hard, Corrosion-resisting; very good on Cast Iron.**
  TITAN BRONZE, doubly-deoxidized, low-fuming; flows at 1617°F.
  TITAN NAVAL BRONZE, flows at 1615°F.
  TITAN WEARWELL BRONZE, flows at 1593°F. Special purpose rod possessing great hardness; for building up worn surfaces and for bearing service, etc.
- **MANGANESE BRONZES: (General Purpose) Specifically recommended for Cast Iron.**
  TITAN MANGANESE BRONZE, doubly deoxidized, low-fuming; flows at 1617°F.
  TITAN NAVAL MANGANESE BRONZE, flows at 1620°F.

Only the purest of raw materials are used in manufacture of TITAN Welding Alloys. Electrolytic copper 99.96 plus in purity and electrolytic zinc 99.99 plus are used, in order to assure elimination of elements, which, if introduced into alloy would prove detrimental to quality and uniformity. *TITAN has established new high standards for bronze rod manufacture.*

Ask for descriptive folders. Sample rods sent upon request.

TITAN METAL MANUFACTURING CO., BELLEFONTE, PA.

TITAN BRONZE WELDING ALLOYS

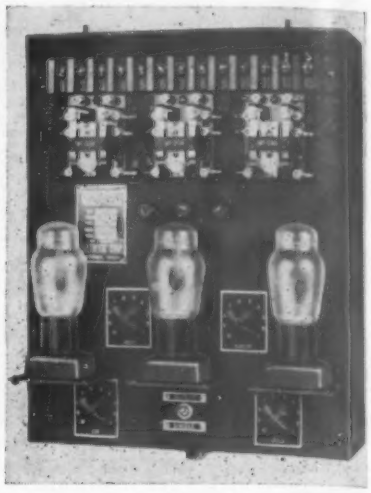
ing and permits faster production are other claimed advantages.

The synthetic alloy rods and fluxes are offered in different analyses according to the type of parent metal to be welded. All of the well-known ferrous and nonferrous metals and their alloys are said to be welded successfully by means of these rods, including joints between parts of dissimilar metals. Color of the weld in each case is designed to match that of the parent metal. Rods also are available for filling up blowholes and other defects in castings.

Timer Eliminates Pressure Switch

★A Model 75 electronic tube-type timer has been added to the line of timers and controllers manufactured by **Weltronic Corp.**, 3097 East Outer Drive, Detroit, Mich. This timer features a minimum of moving parts and eliminates the need of a pressure switch, a feature claimed to insure a minimum of maintenance.

The four adjustments required for squeeze, weld, hold and off time are made by means of control knobs on the front of the panel. A wide range of optional time from 2 to 30 cycles in close steps are claimed so as to provide accurate timing for most stationary or portable, single or multiple spot welding operations using air or hydraulic pressure. Single weld or automatic repeat operation is optional to suit the work. A toggle switch on the front of the panel permits rapid change-over as required.



Time selections are in steps from to 20 cycles

The **Model 75 timer** is available for use with either a magnetic or Ignitron tube contactor and 100 v. 60 cycle current but can be supplied for use on any commercial voltage and frequency.

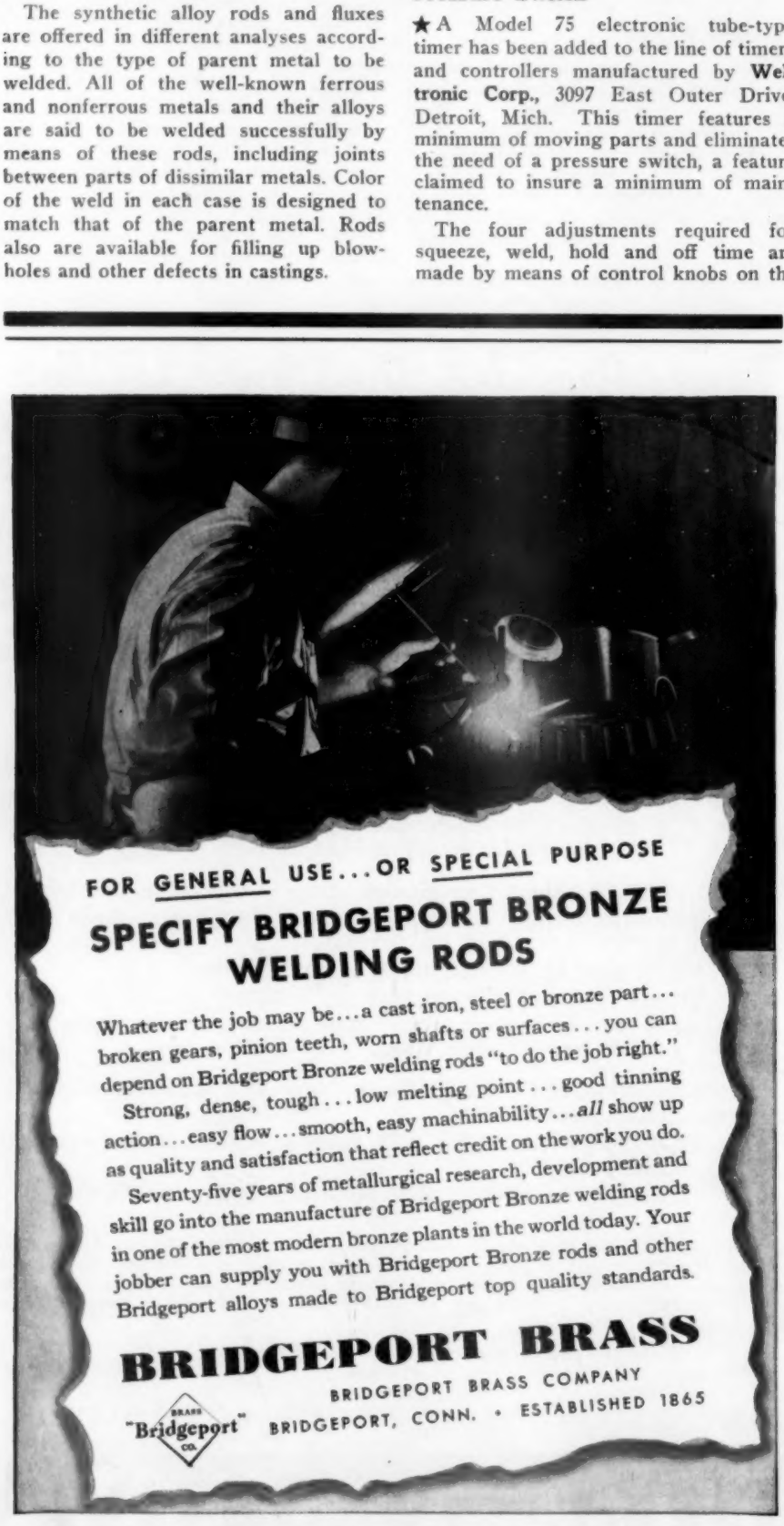
» «

Electric Polishers

★The **Stanley Electric Tool Div.**, New Britain, Conn., have developed two new **Polishers** for the cleaning and polishing of metal, removal of stains or heat tint caused by welding. They are slow speed (600 R.P.M.) Polishers for which proper brushes and compounds have been developed for maximum efficiency.

Brushes have been developed by **The Osborn Mfg. Co.**, Cleveland, Ohio. The No. 2588-S-2, 8¼" in diameter and ½ inch in width, with a very dense brushing face, is recommended. Up to four brushes can be mounted on Arbors available with polishers. A new polish known as **Nu Steel Cleaner and Polish**, and manufactured by **The Pynosal Laboratories, Inc.**, Chicago, Ill., is claimed

These are slow speed polishers.


FOR GENERAL USE...OR SPECIAL PURPOSE
SPECIFY BRIDGEPORT BRONZE WELDING RODS
Whatever the job may be...a cast iron, steel or bronze part... broken gears, pinion teeth, worn shafts or surfaces... you can depend on Bridgeport Bronze welding rods "to do the job right."
Strong, dense, tough... low melting point... good tinning action... easy flow... smooth, easy machinability...all show up as quality and satisfaction that reflect credit on the work you do.
Seventy-five years of metallurgical research, development and skill go into the manufacture of Bridgeport Bronze welding rods in one of the most modern bronze plants in the world today. Your jobber can supply you with Bridgeport Bronze rods and other Bridgeport alloys made to Bridgeport top quality standards.
BRIDGEPORT BRASS
BRIDGEPORT BRASS COMPANY
"Bridgeport"
BRIDGEPORT, CONN. • ESTABLISHED 1865

to give best results with Osborn brushes and Stanley Polishers. Stanley does not supply brushes or polish, but this material can be obtained direct from the makers.

No. 182 Polisher is said to be a two purpose tool—it can be used as a polisher, or a drill chuck can be attached in place of the arbors to make a practical ½" drill. Arbors for two or four brushes and ½ inch Jacobs Chuck are available. No. 187 Polisher has a straight handle and is used for polishing only. Arbors for two or four brushes are available. Both Polishers are equipped with Universal Motors for A.C. or D.C. Current in 110, 125, 150, 220, 230 or 250 volts.

» «

Low Temperature Alloys

Weldoloy alloys and fluxes for low-temperature oxy-acetylene welding, are now being manufactured in the United States by Park Sales Company, and distributed by **Weldoloy Manufacturing Co. Division**, 3 Park Place, New York. Park Sales Company had originally introduced low-temperature welding alloys made in Switzerland. The new arrangement however, permits of an interrupted supply to American users of low-temperature alloys and fluxes.

This material is available in a variety of alloys and fluxes for oxy-actylene welding and, according to the manufacturer, enables welding operations to be performed at unusually low temperatures. Because of this feature, overheating and subsequent warping of welded parts are said to be avoided and stresses eliminated. Weldoloy alloys are supplied in rod form and Weldoloy fluxes in powder or paste form.

Weldoloy alloys for use in the steel, aluminum, brass and bronze industries are now available. These alloys depending on their uses have a tensile strength range between 23,000 and 115,000 p.s.i. and melting points which vary from 360 deg. F. to 1600 deg. F.

» «

Crane Grab Bulletin

Grabs is the title of an 8-page bulletin recently issued by the **Tramrail Div.**, The Cleveland Crane and Engineering Co., Wickliffe, Ohio. This booklet has been prepared by an informative piece for those interested in overhead methods of material handling and features a number of grabs and handling devices for many kinds of material.

» «

Inconel Data

The 1941 edition of Bulletin T-7, **Engineering Properties of Inconel**, contains revised information on mechanical properties of Inconel at ordinary and at elevated temperatures. This bulletin has been released by **The International Nickel Co.**, 67 Wall St., New York. New data for limiting service temperatures in different atmospheres are given.

The sections on Working Properties and Corrosion Resistance have been revised in accordance with the latest mill and field experiences. A general description of all mill products has been added.

» «

Electric Tools

Nineteen new models of high frequency electric tools are shown in the new **THOR High Frequency Electric Tool Catalog**, 1941 edition, now ready for distribution, announces the **Independent Pneumatic Tool Co.**, 600 W. Jackson Blvd., Chicago, Ill. These new models consist of:—balancers, drills, grinders, nut setters, the "Pix-Up" Finder, polishers, rubbers, sanders and screw drivers.

Considerably larger than the previous edition, the No. 61 contains a complete section of balancers and is fully illustrated by tool and action pictures, together with full specifications on all THOR High Frequency Electric Tools. The No. 61 High Frequency Electric Tool Catalog is available upon request to the above company.

Experience Counts
IN SAFETY

Sellstrom provides a complete line of welding helmets and hand shields that fulfill the exacting requirements of the welding industry. Designed for comfort and convenience . . . safety and durability . . . proven by experience.

WRITE TODAY on your letterhead for a No. 221S Welding Helmet for test and a catalog showing our complete line.

Sellstrom Mfg. Co. 642 No. Aberdeen St. Chicago

No. 221 S
Rivetless Lift-Front

Rounded and shaped at all points this helmet is formed of one piece fibre without riveting. Its arched shape insures strength and durability. Patented Vulcoid non-absorbent head harness, with friction hinge, allows raising of helmet above head. Equipped with dual - purpose Lift - front Lens Holder and leather sweatband. Weight 18 oz. with Lens.

INSIST ON SELLSTROM
. . . THERE IS NO BETTER

News of the Industry

Michigan State Welding Conference

Michigan State College and the Detroit Section of the American Welding Society are cooperating in the arrangements for a welding conference to be held at Michigan State College, Lansing, **April 25 and 26.**

The two-day program will feature the work of welding in connection with our National Defense program. One of the highlights of the conference will be a dinner on Tuesday evening with entertainment by the students.

» «

Federal Government Still Seeks Junior Engineers

Because of the increasing need for engineers in national defense work, the United States Civil Service Commission has again announced an examination to fill junior engineer positions in any branch of engineering. The salary is $2,000 a year less a 3½ percent retirement deduction.

Further information and application forms may be obtained from the Secretary of the Board of U. S. Civil Service Examiners at any first- or second-class post office, or from the U. S. Civil Service Commission, Washington, D. C.

Technologists Needed by the Government

The United States Civil Service Commission has announced open competitive examinations to secure technologists for national defense work. Difficulty is being experienced in filling positions in such branches of technology as explosives, fuels, plastics, rubber, minerals, and textiles. Persons qualified in these branches are particularly urged to file application.

The positions to be filled are in several grades with salaries ranging from $2,000 to $5,600 a year. For the lowest grade, that of junior technologist in any specialized branch, applicants will be required to take a written general test. For the other grades, competitors will not have to take a written test but will be rated upon their education and experience.

Applications for the position of junior technologist must be filed at the Commission's Washington office not later than February 20 if sent from States east of Colorado, and February 24, 1941, if sent from Colorado and States westward. For the other technologist positions, applications will be rated as received until December 31, 1941. Further information and application forms may be obtained from the Secretary of the Board of U. S. Civil Service Examiners at any first- or second-class post office, or from the U. S. Civil Service Commission, Washington, D. C.

Personals

Ampco Metal, Inc., Milwaukee, Wis., producers of Ampco Metal and other bronze alloys, has transferred **Mr. T. P. Samuels** from Milwaukee to the Pacific Coast territory. Mr. Samuels will work under the supervision of **Mr. O. D. Cooper**, and his headquarters will be at 918 N. Clybourn Avenue, Burbank, California.

» «

George H. Bucher, President of the **Westinghouse Electric & Mfg. Co.**, announced the appointment of **T. I. Phillips** as assistant to the president.

Mr. Phillips, formerly general works manager, will continue to be in charge of the headquarters manufacturing staff, the Small Motor, Lighting and Transformer Divisions, and the Construction Department of the Company, with headquarters in Pittsburgh. He joined Westinghouse in 1915 and was appointed general works manager in 1935 to serve as central authority for all manufacturing operations of the company.

Manganese Steel **CRUSHER JAWS**

Worn Surfaces Built Up With

MANGANAL

Trade Mark Reg. U. S. Patent Office

11 to 13½% Manganese Nickel Steel

(U. S. Patents 1,876,738, 1,947,167 and 2,021,945)

APPLICATOR BARS and Welding Electrodes

Stulz-Sickles Company Sole Producers

91 N. J. Railroad Avenue Newark, N. J.

Write for descriptive circulars and name of nearest distributor.

STRONG, SMOOTH ALUMINUM WELDS ARE NO SURPRISE

You just naturally expect them — when you use

ALMARC Aluminum Welding Rods

ALFLUX Aluminum Welding Fluxes

WOOLDRIDGE ALUMINUM WELDING PRODUCTS

Glastonbury, Conn.

NEMCO WELD FILLER

Makes Cast Iron Electric Welds Water Tight

SAMPLE ON REQUEST

TESTED TO 70 LBS. PER SQUARE INCH

Attractive Proposition to Distributors

NORTHEAST METALS CO. 4124 TORRESDALE AVENUE PHILADELPHIA PENNA.

Clifton **E. Swift** has become associated with the Weldrod Division of **Ampco Metal, Inc.**, Milwaukee, Wis., to head the development, production, and distribution of Ampco-Trode, a complete line of coated aluminum bronze welding rods, made with the properties of Ampco Metal.

Mr. Swift has been associated with the welding industry since graduating from the University of Illinois, College of Engineering. He joined Westinghouse Electric Mfg. Co. in 1929, where he worked on automatic arc welding applications. In 1931 he became welding engineer for the American Brass Company, developing and applying copper alloy welding processes. Immediately preceding his present work he was welding engineer for C. F. Braun and Company, and welding superintendent at the Young Radiator Company. Mr. Swift is a member of the American Welding Society.

» «

The **Lincoln Electric Co.**, Cleveland, Ohio, announces the appointment of **Stewart J. Hieronymus** as sales engineer with its San Francisco office.

Prior to his appointment, Mr. Hieronymus was associated with Cutler Hammer, Inc. for 12 years. In his new work Mr. Hieronymus will be associated with **L. P. Henderson,** manager of the San Francisco office together with **C. E. McClure** and **W. F. Fischer.**

» «

H. F. Schotters has been appointed to supervise the distribution of **Hobart Arc Welders** in northern Indiana and western Michigan, with headquarters at **Koontz-Wagner Electric Co.**, South Bend, Ind. Local distributors appointed to date include **C. H. Antrim**, Grand Rapids, Mich., **Hoosier Oxygen Service**, Fort Wayne, Ind., and **Bingrods, Inc.**, Kalamazoo, Mich.

» «

C. I. MacGuffie has been appointed Manager Sales, Electric Welding Section of the **General Electric Co.**, according to an announcement by J. E. N. Hume, Commercial Vice President of the company. Mr. MacGuffie succeeds L. D. Meeker, now associated with the Smith-Meeker Engineering Company, New York City.

A native of West Pittston, Pennsylvania, Mr. MacGuffie was graduated from Pennsylvania State College in 1925 with the degree of B.S. in Electrical Engineering. He immediately became associated with General Electric in its testing department at Schenectady, going to the company's Philadelphia office in 1928 to handle welding sales. In 1929, he was made Welding Specialist of the Atlantic District, and left Philadelphia for Schenectady in 1939 to become assistant to Mr. Meeker.

Mr. MacGuffie is a past chairman of the Philadelphia section of the American Welding Society. He is now a member of the Schenectady section of this society, and an associate member of the A. I. E. E.

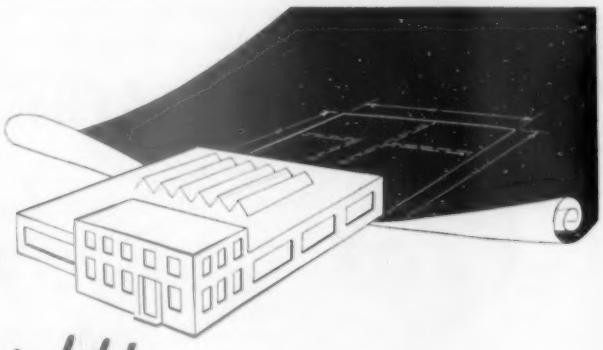
Current Reviews

Rail-End Welding

The **Lincoln Electric Co.**, Cleveland, have released an engineering monograph discussing **"The Arc Welding of Rail-Ends"** based on the results of 15 years study of this problem. There is discussed the principles of rail-end welding and pointers on how to obtain the maximum life for welded rail-ends. Results that have been obtained by using various welding procedures are described and "Teleweld" specifications for welding rail-ends are given.

This eight page monograph with its many graphs and illustrations will be found to be a very informative discussion on rail-end welding and its problems.

ADD *to Your* PLANT CAPACITY *...Overnight!*



If your production involves arc welding, you can step up output per man-hour, per foot of floor space, per kilowatt of available power . . . overnight . . . with G-R welders.

Manual, automatic and remote-control G-R units from 125 to 2,000 amperes—for single or multi-circuit operation—are ready to handle your job. Write or wire today for complete information.

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Factory: 1009 Fruitvale Ave., Oakland, Cal.
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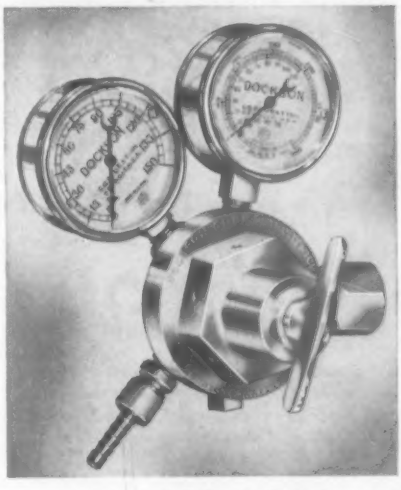

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DOCKSON *Corporation*
WELDING & SAFETY EQUIPMENT
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Positioner Bulletin

Bulletin WP-20 is the name of the newest of Cullen-Friestedt Co's. Welding Positioner Bulletins. This 12 page bulletin not only describes the product of this Chicago manufacturer, but also explains the function of a welding positioner. There are included a number of illustrations showing the various types of positioners in use on a variety of welding operations.

Bronze Data

Titan Metal Mfg. Co., Bellefonte, Pa., have published a 4 page bulletin Bronze Welding Rods. In this bulletin there is described the various doubly deoxidized welding alloys of Titan manufacture as well as information concerning their average physical properties. On the fourth page of this bulletin there is given a number of suggestions regarding the use of bronze welding rods.

The Improved "Round File" Gas Lighter

Large File Area

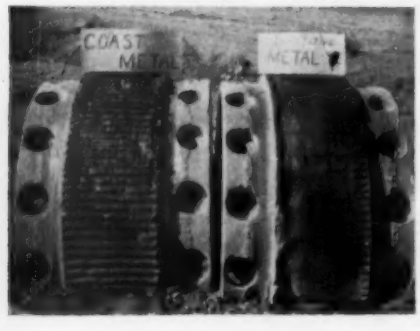
The "Round File" construction provides a very large file area — *approximately one square inch.* This assures longer life for the lighter. The file is of superior quality and can be easily replaced.

Many superior design and construction features combine to make the Improved "Round File" the most economical and efficient lighter on the market. Get acquainted with Improved "Round File" and its many advantages.

Circulars and prices on request.

SAFETY GAS LIGHTER CO. (Est. 1901) **LYNN, MASS.**

COATING WITH COAST ...Hot Clinker Rolls *in the* Cement Mill



Roll left faced with Coast Metals No. 112 is ready for many more hours of service. Its mate right working under identical conditions but faced with a competitive hard facing material must be reconditioned or scrapped.

Hard facings have been developed for industries where abrasion, impact and high temperature reduce service life of wearing parts, but with Coast Metals you get even greater service life as is evidenced by the two hot clinker rolls illustrated. Investigate Coast Metals today for your hard facing jobs.

There are 11 types of Coast Metals, all easily applied to any ferrous metal, alloy steel, manganese steel, cast or chilled irons by the oxy-acetylene torch or electric arc.

WRITE FOR DESCRIPTIVE LITERATURE AND NAME OF LOCAL JOBBER.

COAST METALS, Inc.
1006 McKinley Ave. S. W.
CANTON, OHIO

Weld Timer Bulletin

National Time & Signal Corp., 600 E. Milwaukee Ave., Detroit, has just released a new **Bulletin No. 146** entitled "Swift and Sure." In this bulletin is given descriptive information, uses, operating characteristics and many other pertinent facts on the extensive lines of mechanical timers produced by this organization. This 8 page bulletin with its many illustrations will afford the reader a clear picture of the possibilities and working principles of these synchronous motor driven, cam operated timers.

» «

Accident Facts for 1940

No single catastrophe in the United States last year approached the daily average of almost 100 lives lost in automobile accidents, according to a new booklet entitled **"Here Today"**—just issued by **The Travelers Insurance Co.** The booklet is the eleventh in a series issued annually and presents a comprehensive analysis of the facts about accidents in which 35,000 persons were killed and more than 1,300,000 others were injured in 1940.

Highlights from the annual report, based on official reports from the 48 states, include the following interesting facts: Exceeding the speed limit was responsible for 40 per cent of the fatalities and 26 per cent of the injuries in 1940. Every third victim of a fatal traffic accident last year was a pedestrian. More than 97 per cent of all drivers involved in accidents had a year or more of operating experience. Almost 86 per cent of all fatal accidents occurred in clear weather and almost 78 per cent happened when the road surface was dry.

A composite picture of 1940's typical accident driver would show that he was an experienced, middle-aged male and that he was driving a passenger car in good mechanical condition in clear weather during the early evening hours of a Saturday or a Sunday.

Other special features in this year's booklet include statistics and editorials on such phases of the traffic problem as speed, pedestrian accidents, and the need for greater courtesy on the highways. Single copies or quantities of this booklet are available through the company or any of its representatives.

» «

Timer and Contactor Bulletins

Two new bulletins have been released by **The Electric Controller and Mfg. Co.**, 2706 S. 79th St., Cleveland, Ohio.

Bulletin 1201 describes timers and includes data on the EC&M interrupted timer and the two low cost Neotrol timers. One of these Neotrol timers is a definite time type while the second is a timer of the compensated type.

Bulletin 1211 covers the several types of new EC&M Type LWZ heavy duty magnetic contactors giving construction and operating details.

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when you put SURE GRIP ELECTRODE HOLDERS in your welding department

EIGHT REASONS WHY SURE GRIP HOLDERS will give YOU longer, better service . . .

1. Shatterproof, Air Cooled Handle;
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3. Light in Weight and Well Balanced;
4. Length is Adjustable—8½ to 12 inches;
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6. Jaws are Replaceable;
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8. Furnished in Two Sizes—300 amp. and 400 amp. with Either Mechanical or Solder Type Cable Connection.

LOW PRICES
$4.50 for 300 amp. model
$5.25 for 400 amp. model
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A SURE GRIP After 7 Years Service

The ravages of time and wear have little effect on Sure Grip Electrode Holders as shown by this unretouched photograph, taken after 7 years service in a busy welding shop. None of the original working parts were ever replaced.

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Specializing in automatic welding for 20 years.

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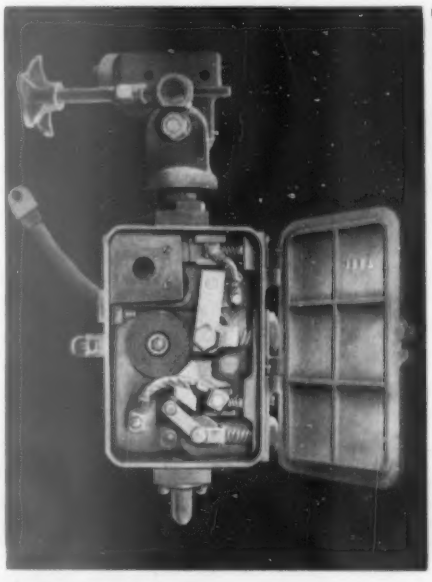

For salvage welding of carbon chrome, and carbon moly castings or other cast alloys of similar characteristics which are to be heat treated after welding. (Note the treatment of welded shrink cracks on heavy plate at right.)

"HARNIMOLY"—

Easily Machined in As-Welded State . . . Responds to flame hardening or heat treatment, up to hardness of 415 Brinell.

When used in repairing during heat treatment of metals similar to those above, "Harnimoly" makes it possible to obtain virtually the same characteristics as the parent metal in impact values.

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WELDING ELECTRODES

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Obituary

Lewis E. Saunders, 67, a vice president of Norton Co., Worcester, Mass. and pioneer in the development of electric furnace abrasives, died February 20 after an illness of two weeks. He had been in poor health for several months.

Mr. Saunders had been vice president of Norton Company since 1937, and a director since 1921. He also formerly was manager of the company's abrasive plants and research laboratories. Before joining Norton Company he was associated in Ampere, N. J., with Charles B. Jacobs, who developed the process of making the aluminous abrasive known as Alundum. This product was acquired by the Norton Company in 1900, and Mr. Saunders became associated with the Worcester company three years later.

He served variously as chemical engineer, metallurgist and superintendent of abrasive plants and research laboratories. He had long been recognized as one of the nation's leading authorities on electrochemical production of abrasives. He was a member of American Electrochemical Society, American Chemical Society, Society of Chemical Industry of Great Britain, Worcester Club and Tatnuck Country Club. Mr. Saunders was graduated from the University of Rochester, B. S., in 1897.

» «

John T. Ryan, 57, President of Mine Safety Appliances Co., Pittsburgh, died in Miami, Fla. on February 20.

Mr. Ryan was a native of Huntingdon County, Pennsylvania—attended Juniata College and the Pennsylvania State College from which he graduated in 1908 with a B.S. Degree in Mining Engineering. In 1934 he was given the degree of Honorary Engineer of Mines by the same institution.

During his entire business life he was actively identified with the mining industry. After graduation he became affiliated with the Rocky Ridge Coal Co. and later was Superintendent and Mining Engineer for Langdon Coal Company of Huntingdon, Pa.

From 1911 to 1914 he was in charge of the mine rescue and safety, and mine lamp testing division of the United States Bureau of Mines. In 1914 seeing the need for more adequate safety equipment, he and George H. Deike of Pittsburgh founded the Mine Safety Appliances Co., which today is the largest manufacturer of mining and industrial safety equipment in the world.

In 1915 Mr. Ryan worked with Thomas A. Edison in the inventor's laboratory at West Orange, N. J., on the design and development of the Edison Safety Cap Lamp, which is so universally used today in underground Coal and Metal Mines throughout the world. In December, 1940, he was made an Honorary Member of the Edison "Old Timers' Club" comprised of the men who worked with the late inventor in his early years.

The Oxyacetylene Flame and Its Applications

★ The three types of oxyacetylene flame may be used for welding a great number of materials. Aided by the accompanying chart it is possible to determine the preferred flame type.

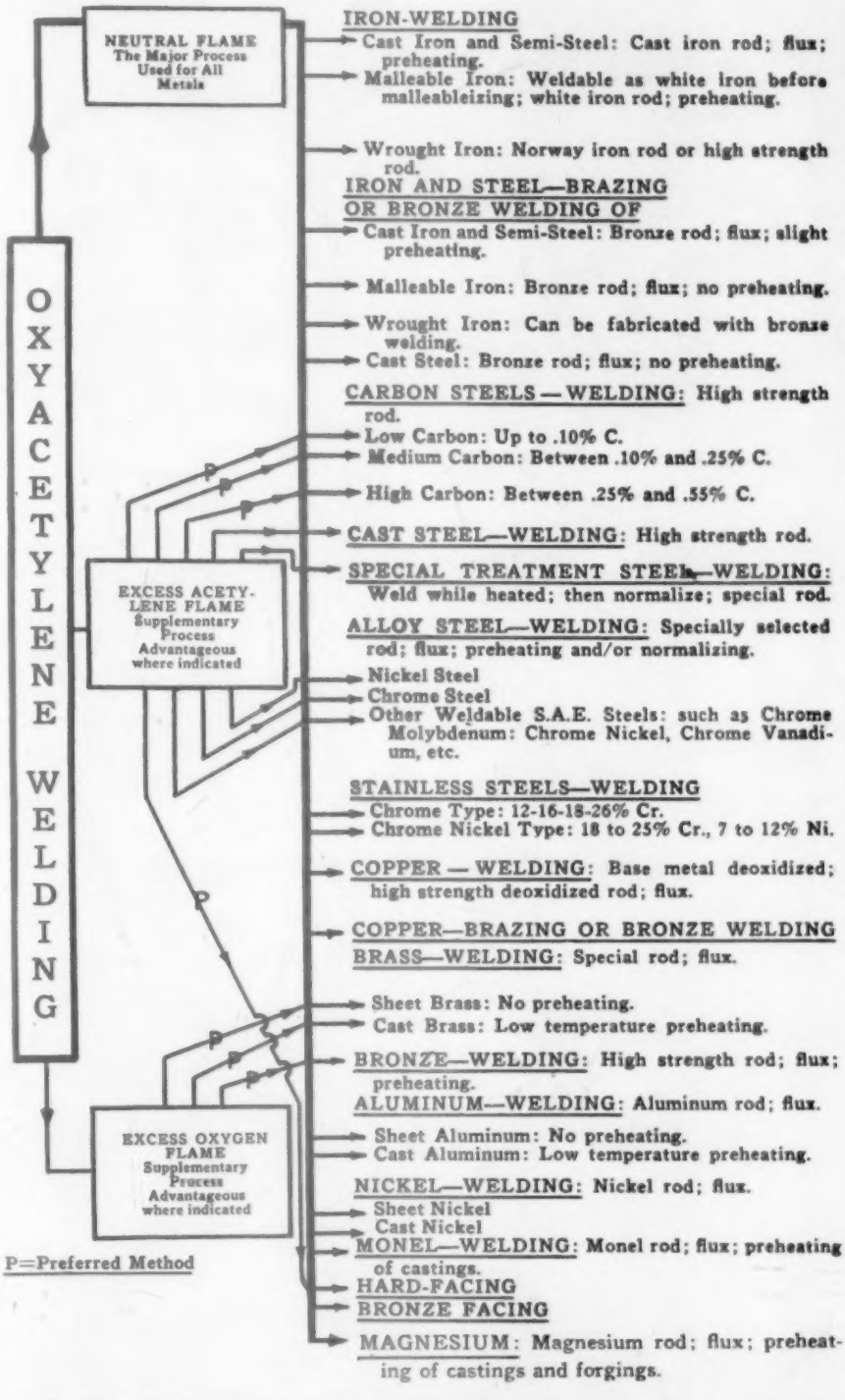
When an engineer specifies oxy acetylene welding or a weldor undertakes an oxy acetylene welding job, both should be aware that the work can be undertaken using either of three types of oxy acetylene flames. The engineer is usually unaware of this flexibility of the oxy acetylene flame, consequently, neutral carburizing and oxidizing flames mean little if anything to him. A weldor knows of the three flame types but often does not know which is the preferred flame for use on a material with which he is unfamiliar.

These two common lacks of complete understanding of oxy acetylene welding account for the accompanying diagrams of the oxy acetylene flame and its applications.

The chemical characteristics of the oxy acetylene flame and its resultant effect on molten metal may be varied considerably by only a slight adjustment of the oxygen-acetylene mixture ratio.

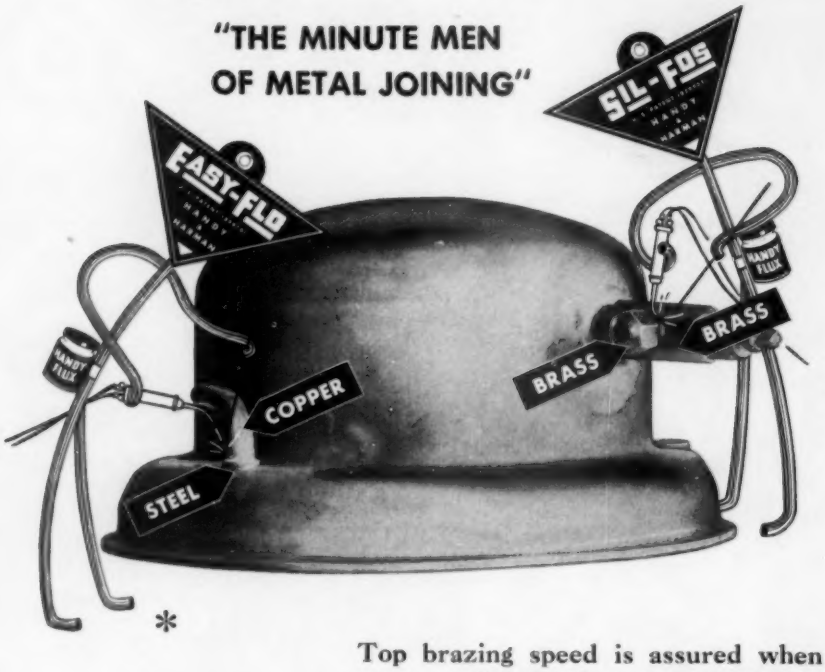
When the ratio of oxygen to acetylene is one to one, a "neutral" flame is produced. It is this this flame that is used for most oxy acetylene welding applications. By increasing the amount of acetylene in the mixture, the flame becomes "carburizing" because of the excess of acetylene. A flame of this type is often used for welding steels, certain alloy steels and for hard-facing applications. Had the oxygen ratio been increased instead of the acetylene, the flame would become an "oxidizing" flame, a flame preferred for brazing operations on brasses and bronzes.

Editor's Note: We are indebted to the International Acetylene Association for much of the information presented on this data sheet.


OXYACETYLENE WELDING
NEUTRAL FLAME
The Major Process
Used for All
Metals
EXCESS ACETY-
LENE FLAME
Supplementary
Process
Advantageous
where indicated
EXCESS OXYGEN
FLAME
Supplementary
Process
Advantageous
where indicated
P=Preferred Method
IRON-WELDING
Cast Iron and Semi-Steel: Cast iron rod; flux; preheating.
Malleable Iron: Weldable as white iron before malleableizing; white iron rod; preheating.
Wrought Iron: Norway iron rod or high strength rod.
IRON AND STEEL—BRAZING OR BRONZE WELDING OF
Cast Iron and Semi-Steel: Bronze rod; flux; slight preheating.
Malleable Iron: Bronze rod; flux; no preheating.
Wrought Iron: Can be fabricated with bronze welding.
Cast Steel: Bronze rod; flux; no preheating.
CARBON STEELS—WELDING: High strength rod.
Low Carbon: Up to .10% C.
Medium Carbon: Between .10% and .25% C.
High Carbon: Between .25% and .55% C.
CAST STEEL—WELDING: High strength rod.
SPECIAL TREATMENT STEEL—WELDING: Weld while heated; then normalize; special rod.
ALLOY STEEL—WELDING: Specially selected rod; flux; preheating and/or normalizing.
Nickel Steel
Chrome Steel
Other Weldable S.A.E. Steels: such as Chrome Molybdenum: Chrome Nickel, Chrome Vanadium, etc.
STAINLESS STEELS—WELDING
Chrome Type: 12-16-18-26% Cr.
Chrome Nickel Type: 18 to 25% Cr., 7 to 12% Ni.
COPPER—WELDING: Base metal deoxidized; high strength deoxidized rod; flux.
COPPER—BRAZING OR BRONZE WELDING
BRASS—WELDING: Special rod; flux.
Sheet Brass: No preheating.
Cast Brass: Low temperature preheating.
BRONZE—WELDING: High strength rod; flux; preheating.
ALUMINUM—WELDING: Aluminum rod; flux.
Sheet Aluminum: No preheating.
Cast Aluminum: Low temperature preheating.
NICKEL—WELDING: Nickel rod; flux.
Sheet Nickel
Cast Nickel
MONEL—WELDING: Monel rod; flux; preheating of castings.
HARD-FACING
BRONZE FACING
MAGNESIUM: Magnesium rod; flux; preheating of castings and forgings.

Certainly YOU CAN SPEED-UP PRODUCTION *with . .*

"THE MINUTE MEN OF METAL JOINING"



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SIL-FOS
is free flowing and penetrates into joints rapidly at 1300°F. Its low percentage of silver gives it brazing qualities that only silver can give. Use it for making better joints between non-ferrous metals only—copper, brass and bronze.

EASY-FLO
is the fastest working brazing alloy known today. It has the lowest flow point—1175° F.—of any alloy that produces joints of high strength. It contains a medium percentage of silver. Use it to join ferrous, non-ferrous or dissimilar metals.

HANDY FLUX
To take full advantage of low temperature brazing you need a flux that is fluid and active when the alloys are ready to flow. Handy Flux is fully active at 1100°F. Always use it with Sil-Fos and Easy-Flo.

Top brazing speed is assured when you use SIL-FOS and EASY-FLO because: (1) They are the fastest acting brazing alloys; (2) They have the lowest working temperature of any alloys capable of making high strength joints.

And with this top speed you get reliability in the finished joints.

It's the combination of speed with reliability that accounts for the tons of SIL-FOS and EASY-FLO used every year on air conditioning equipment, airplanes, motor vehicles, ships, tanks, firearms, heating units, refrigeration, electrical equipment, piping and tubing and many other products.

Try SIL-FOS or EASY-FLO on one job in your plant. Pick one that is holding back production or one where rejects are high. We'll be glad to cooperate. Write for full details — ask for Bulletin W-5, 9 and 10.

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THE TECHNICAL SLANT

Pardon Our Error

Metallurgy

WELDING METALLURGY. By O. H. Henry and G. E. Claussen. Published by the American Welding Society is priced at $1.50 per copy instead of 50 cents as was stated in the review of this book appearing in The Technical Slant of February 1940 issue of The Welding Engineer.

» «

Aircraft Maintenance

AIRPLANE SERVICING MANUAL. *By Victor W. Page. Published by Norman W. Henley Publishing Co., New York, 1938. Cloth, 6x9 in., 1000 pages. Price $6.00.*

Col. Page's latest book, Airplane Servicing Manual, might well have been termed an Encyclopedia of Airplane Maintenance. Starting in chapter one with an explanation of the work of an aircraft mechanic, the author proceeds to cover this work in detail in the following twenty-eight chapters. Special emphasis has been placed on the problems involved in the organizing and equipment on aircraft repair depot and the tools and supplies needed for aircraft maintenance and repair.

The principle thought of the book is that of preparing the reader to qualify for a C.A.A. license as an aircraft or aircraft engine mechanic. Aside from the mechanical end of this reference book, with its data and operating information on machine tools, welding and various methods of repair of aircraft; there is included considerable information on the materials used in aircraft construction.

Airplane Servicing Manual will be found to be a valuable reference manual for one considering becoming an aircraft mechanic. To make some of the problems discussed more easily understood, there is included with the text, nearly 500 illustrations.

» «

Metallurgy

GLOSSARY OF METALLAGRAPHIC TERMS. *By A. Neill Greenwood. Published by the Tait Publishing Co., Melbourne, 1941. U. S. Agents, G. E. Stechert & Co., New York, Cloth, 5½x8½ in. 84 pages. Price $1.50.*

This glossary was published primarily as a reference book for students of metallagraphy. The increasing use of metallurgical terms in industry will prove this to be a valuable reference book for many engaged in metal working.

Aside from its value as a reference book, the "Glossary of Metallagraphic Terms" will be found to be a convenient text for those desiring to hear more of metallagraphy by home study.

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COLMONOY Sweat-on Paste, applied with the arc, provides a Rockwell hardness of from C-68 to C-72. Its extreme hardness and resistance to abrasion enable it to out-wear ordinary hard metals several times.

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IMPROVED
SIMPLEX ELECTRODE HOLDERS
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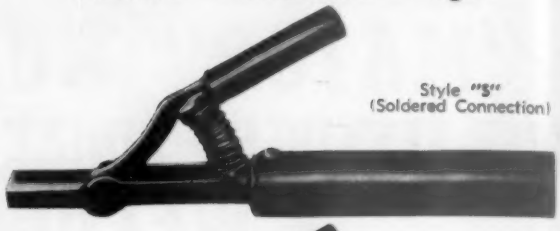

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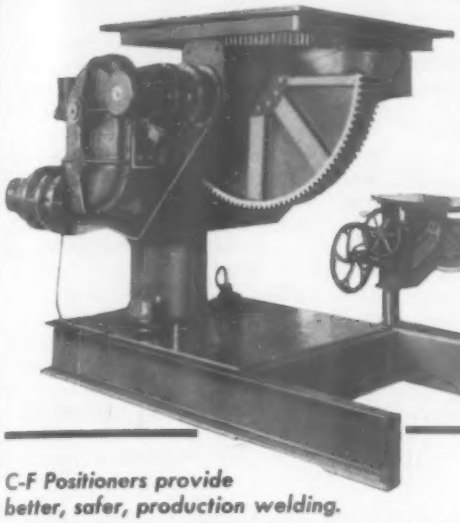

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C-F Positioners provide better, safer, production welding.

Everyone concerned with welding knows that positioned welds, made down-hand are the best. Innumerable time studies also show these additional advantages of positioned welding: savings in welding time, cleaning time, overhead crane service and increased safety.

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Officially approved for protection against fumes of metals such as generated when welding or burning materials containing or coated with lead, zinc, cadmium and other toxic metals. Combines new comfort and protection with complete working freedom; permits use of goggles or headgear without interference. Can be worn under standard welding helmet by simply removing chin-rest. Features:

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"saved 42% in welding labor costs"

Records on file show labor savings ranging from 25% to 50% and rod savings of 5% to 7% through the use of

Ransome POSITIONERS

Write for literature
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RANSOME CONCRETE MACHINERY CO.
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1 You get the right grade for your private formula. PQCo. specializes in Silicates of Soda and has over 30 grades (liquid and powders) from which to choose.

2 Each grade, manufactured to meet definite standards, is consistently the same, delivery after delivery. Leading rod manufacturers rely on PQ uniform quality.

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SILICATE OF SODA *SPECIALISTS*

Temperature Control Catalog

The **Brown Instrument Co.** has just published a new catalog, **No. 9400 — Brown NEW-MATIC Remote Transmission.** This catalog tells "How", "Why", "When" and "Where" the NEW-MATIC Remote Transmission may be applied for indicating, recording and control of temperature, pressure, flow and liquid level in hazardous atmospheres where the use of electrical transmission is not desirable nor permissible. Operating features and description of the principle working parts of the transmitting and receiving instruments are given in detail.

» «

Brass Welding Handbook

Chase Welding Rods is the title of a new 33 page handbook published by the **Chase Brass and Copper Co.**, Waterbury, Conn.

This is an excellent booklet containing many pointers on the welding of copper and copper alloys. It is particularly pointed out that "the term welding as used in the booklet indicates actual fusion of the parent metal with filler materials and is not to be confused with brazing."

There is also included information, specifications and data on Chase copper and copper alloy welding rods; as well as information on welding methods and carbon arc and oxy-acetylene welding of copper and red brass.

Recent Patents

Goggle Lens

2,230,369. **Henry W. Wise,** Flint, Mich. Filed Mar. 30, 1938. Issued Feb. 4, 1941. By this invention there is provided a coating for the outer surfaces of the glass of goggle lens. The coating is a sodium silicate solution which, after it is applied, melts above the melting point of the glass of the lens. The silicate also has about 25% less conductivity of heat than glass. The film constitutes a protective coating to receive the sparks or particles of molten metal and to dissipate the heat sufficiently to prevent embedding of the particles in the glass or film. After use, the coating may be readily removed by the use of water; and a new coating is then applied.

» «

Butt-Welding

2,231,014. **Arthur R. Lytle, William Morton,** and **Leonard V. Spangberg,** Niagara Falls, N. Y., assigned to **Union Carbide & Carbon Research Laboratories, Inc.,** of New York. Filed Dec. 3, 1938. Issued Feb. 11, 1941. For butt-welding rails, beams, pipes, rods, and the like, a new process and apparatus are described. The apparatus maintains the metal members to be welded in accurate axial alignment during the welding operation; supplies heat adjacent the joint throughout the thickness of the metal for a selected distance on either side of the joint; prevents physical separation of the abutting end portions during the early stages of the welding operation; regulates the extent of upset at the welding zone and removes the upset metal from the joint while it is still at high temperature; and refines the grain structure of the welded joint, utilizing in part for the purpose, heat present from the welding and reshaping operations.

» «

Rail Welding

2,231,027. **Oskar Renner, Jr.** Budapest, Hungary. Filed Sept. 15, 1937. Issued Feb. 11, 1941. Rail ends to be welded are cleaned and made smooth and are then placed in abutting relationship. Heat is applied over a zone near the joint while a pressure of 300 to 2000 pounds per square inch is applied. The heat is raised to a welding temperature with an oxyacetylene flame or by induced electric currents.

» «

Aluminum Welding

2,231,317. **George S. Bernard, Jr.,** New Kensington, Pa., assigned to **Aluminum Company of America,** Pittsburgh, Pa. Filed April 14, 1939. Issued Feb. 11, 1941. The inventor points out that heretofore difficulties have been experienced in producing satisfactory flash welds between pieces of aluminum of compact and relatively large, cross-sectional area. This has been due to excessive spattering and burning away of the metal, so that no weld is made, or a weld of inferior

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strength results. According to the invention, the work pieces are clamped in the dies of a flash welding machine, with the ends of the pieces almost touching or partially touching each other. The dies are adapted to carry welding current to the work pieces. The machine is then pre-adjusted to move one of the parts toward the other at a predetermined and preferentially accelerated speed. The current is then turned on and the die-driving mechanism started. Upon a slight initial contact of the work pieces, an arc is created which heats the ends to a welding temperature. After the arcing has continued for a sufficient period to bring the metal into proper welding condition, the arc is extinguished by momentarily cutting off the current. The ends come into contact at this point and the current is turned on again but no arcing occurs when the curent is resumed. The metal is hot worked at the welding zone during the second flow of current.

» «

Welding Cast Iron

2,229,405. **Charles H. Currier,** Buffalo, N. Y., assigned to **Ross Heater & Mfg. Co., Inc.,** Buffalo, N. Y. Filed Sept. 14, 1939. Issued Jan. 21, 1941. This invention applies to the welding of cast iron pipe sections; as an example, in the welding of cast iron hubs to the ends of cast iron shells in the manufacture of heat exchange apparatus. According to this method, the adjacent ends to be welded are first beveled and then brought together to form a V-shaped welding groove. The aligned parts are then secured together by tack or spot welding at points in the groove. By means of a radial nozzle gas burner unit inserted into the pipe sections the sections to be welded are preheated to between 1100 and 1300 degrees F. At these temperatures, the walls of the groove will show a dark red. The heat is then reduced to maintain the regions adjacent the groove at a holding temperature sufficient to prevent damage from localized heating at welding temperatures and from too rapid cooling after welding. The groove is then filled with welding metal from the outside. The heater is then used to increase the temperature to a stress-relieving temperature. Finally the weld and the adjacent regions are inclosed in an insulating material to prevent heat dissipation at a rate likely to damage the weld. An asbestos bag may be used for insulation.

» «

Tilt Table Welder

2,229,570. Cecil **D. Howard,** Swarthmore, Pa., assigned to **Sun Shipbuilding & Dry Dock Co.,** Chester, Pa. Filed Sept. 26, 1938. Issued Jan. 21, 1941. This patent describes an apparatus for welding shapes to plates. The structure includes a tilting table for the support of work to be welded. Mounted on and supported by the table is a carriage adapted to move with respect to the table in a direction at right angles to its tilting axis. A bridge is supported from the carriage and is adapted to extend at an angle to the direction of movement of the carriage. A welding head is supported from the bridge and is adapted to move lengthwise of the bridge. The welding head, by this movement, can be placed into operative position for welding the work on the table. Transverse movement is provided for effecting welding of the work.

» «

Welder's Headgear

2,229,706. **John H. Schneider,** Wilkinsburg, Pa., assigned to **Mine Safety Appliances Co.,** Pittsburgh, Pa. Filed April 14, 1938. Issued Jan. 28, 1941. This invention relates to protective headgear for welders. The device provides a unitary piece which protects the head, face and lungs of the wearer, which effectively shields the face from intense heat, which is readily accommodated to different individuals, and which is strong and durable. In accordance with this invention, a face shield, provided with the usual sight opening covered by a removable dark glass, is supported in front of the face by a blow-resistant hat to which it is pivotally connected to permit the shield to be swung upwardly out of the line of vision. Connected to the inner face of the shield is a respirator which is adjustably mounted so as to

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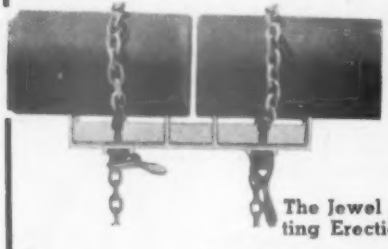

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» «

Welding Flux

2,229,863. **Augustus A. Merrill,** Steele, N. Dak. Filed No. 15, 1939. Issued Jan. 28, 1941. Iron, steel, cast steel or copper may be readily welded, each to its own kind or to any of the other kind by using a welding flux compound consisting by weight of about 20 parts borax, 1 part iron sulphate (copperas), and 1½ parts potassium carbonate (Lewis lye).

» «

Press Welding

2,229,993. **William A. Weightman,** Philadelphia, Pa., assigned to **Budd Mfg. Co.,** Phila., Pa. Filed May 19, 1937, Issued Jan. 28, 1941. A method and apparatus patent relating in general to the production of sheet metal box section beam or column elements and in particular to a method for the quantity production of sheet metal box section beams. By this invention, it is stated in the patent, a high degree of accuracy of shape and dimension can be obtained. In addition a high degree of strength of the spot welds in the beam is secured. The method of spot welding a flat strip cover sheet onto the open flanged side of a flanged channel beam comprises holding the beam against change of form and position, laying the cover sheet upon the flanges of the channel beam along the beam and across the open side of the channel, clamping the cover plate to the beam first at the middle portion and then at the two end portions, and spot welding the side marginal edges of the cover sheet to the flanges while so clamped. The machine includes a work holder arranged to receive and hold a channel section beam, means for applying the cover sheet to the beam under pressure over different portions in succession, and a spot welder for securing the cover strip to the beam from end to end.

Welding Light Metals

2,230,021. **Alois S. Weibel** and **Hans Weibel,** Wohlen, Switzerland. Filed Oct. 19, 1938. Issued Jan. 28, 1941. A characteristic feature of this patented welder is that two electrodes are adjustably arranged almost at right angles in a holder provided with a handle and converge in elevation towards the weld and in plan away from the direction of movement so that their mutual distance can be altered without breaking the circuit. The holder avoids the use of an arc and the danger of overheating and forming oxides is also avoided because the degree of heating only amounts to a fraction of that required for the electric arc or the flame of a blow pipe. Either direct or alternating current of between 3 and 7 volts at 80 to 350 amps. are used. The device is particularly suitable for welding thin sheets of low melting point metal. The electrode ends are arranged as cutting edges. The electrodes may consist of carbon or a fusible or high melting point material. Flux and welding wire may be used with the device.

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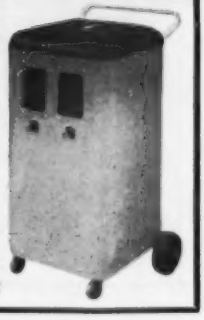

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